No. 1912 Vol. XLVIII AUGUST 16th, 1945

FLIGHT

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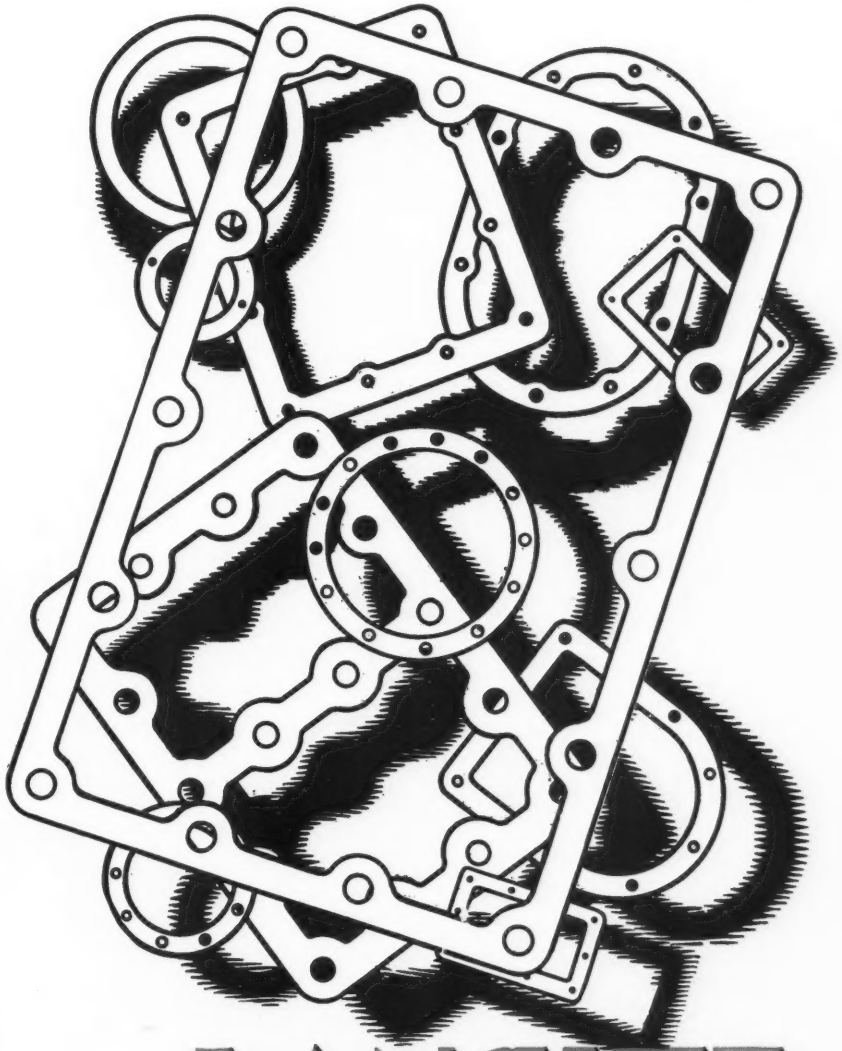

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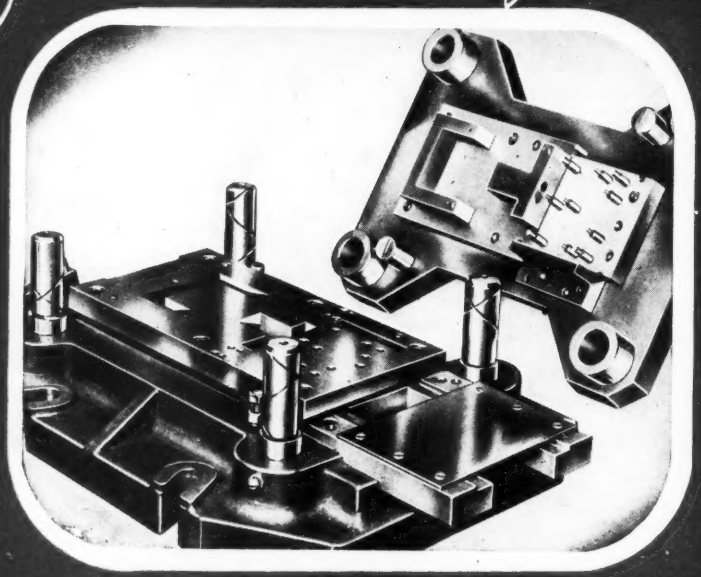

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FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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The Outlook

Peace on Earth

WHILE on the point of going to press with this week's issue we have not been told officially that Japan has surrendered, although it is difficult to see what else she could do, faced with attacks by Russia in Manchuria and the certainty of more atomic bombs on her homeland. The delay that occurred in replying to the Allies' conditions was probably due to the need, from the Japanese point of view, to save "face." Before he resigned, Mr. Churchill said that he thought the war with Japan might end sooner than had once been considered possible. He knew about the atomic bomb, and without doubt he also knew the intentions of Marshal Stalin. What the various commanders knew is, of course, a secret; but only last Thursday Admiral Lord Louis Mountbatten explained to the Press that, though we had beaten Japanese forces in Burma and elsewhere, the bulk of the Japanese Army had not yet been heavily engaged. It was distributed between Japan and China. Japanese troops which have been defeated are, he said, a very different proposition from well-fed and well-equipped Japanese who have not felt the strength of the Allies. Even with Russian help by land it would have been a tough job to reduce the unbeaten millions of the Japanese Army.

Now the task need not, we hope, be undertaken. No more Allied soldiers, sailors and airmen need lose their lives in capturing the last ditch in which Nippon might have held out. That is the first thought in our thankful hearts. Secondly, we shall think of all the thousands of British, Dominion and Allied prisoners in the hands of the barbarous Japanese. Not much news has reached this country since the dreadful day of the surrender of our forces in Singapore—the worst disaster in our military history, as Mr. Churchill called it. What news has leaked through has told of malnutrition and other forms of brutality. Those who have survived will soon be in the hands of their loving countrymen once more.

Finally, we are glad that it may not be necessary to drop any more atomic bombs. We wanted to reduce the enemy without losing Allied lives; but it is not pleasant to think of the women, children and hospitals which must have been swept into annihilation by the force of the bombs.

Except for the Russian advance into Manchuria, the most devastating blow has been from the air. Both the German and Japanese wars have been won by the integration of all three elements. The air was the latest to enter the lists. It has been indispensable throughout, and it has fallen to its lot to ring down the curtain. May it be long before it has to fight again.

New Air Lords

IT is a rule of the British Constitution that a certain proportion of Cabinet Ministers must be in the House of Lords. When Mr. Ramsay MacDonald was entrusted by the King with the formation of a Cabinet he found some slight difficulty in fulfilling this stipulation. Brig. Gen. Thompson, it will be remembered, rather reluctantly accepted a peerage, and took the control of the Air Ministry to the Upper House. Mr. Attlee is more fortunate in having found in Viscount Stansgate a member of the Labour Party who has experience of office, has served with gallantry in the Air Force, and was already a peer. As Mr. Wedgwood Benn, M.P., the new Air Minister served in the Yeomanry in the First World War and fought with great gallantry in Gallipoli. He was made a D.S.O. Then he transferred to the Royal Flying Corps, and in due course won the

D.F.C. It is therefore certain that his knowledge of war flying is not merely that of a distinguished amateur. Having been Secretary of State for India in 1929-31, he is not unfamiliar with Cabinet business, and his most recent appointment as Director of Public Relations at the Air Ministry has brought him up to date with the working of the important department which he has now to control. He was born in 1877. Judging by his record he is well qualified for his new post, and we all hope that he will fulfil expectations.

The other Minister who controls part of the British flying future is another member of the House of Lords, Lord Winster. He received his peerage in 1942. His record shows no practical connection with air matters, but he has studied them, written books about them, and frequently engaged in debates on the subject. Experience of active flying is no guarantee that a man will make a wise director of flying policy; while thoughtful study of the subject may produce the desired effect. A very great deal hangs on the direction of the Ministry of Civil Aviation. It will, if wisely conducted, contribute largely to the future prosperity of the British race and Empire.

The appointment of Wing Commander John Strachey as Parliamentary Under-Secretary for Air came as a surprise to most people. The whole country has listened to his broadcasts on many occasions, and the sweet reasonableness of his views has won him wide popularity. He joined the R.A.F.V.R. in February, 1941, and was adjutant of No. 87 Squadron. He has been Public Relations Officer of a Bomber Group and in North Africa, and he has worked under Air Marshal Peck, Assistant Chief of the Air Staff. He therefore brings a lot of useful experience to his new appointment, and again we repeat that that may be more advantageous than a record of fighting in the air.

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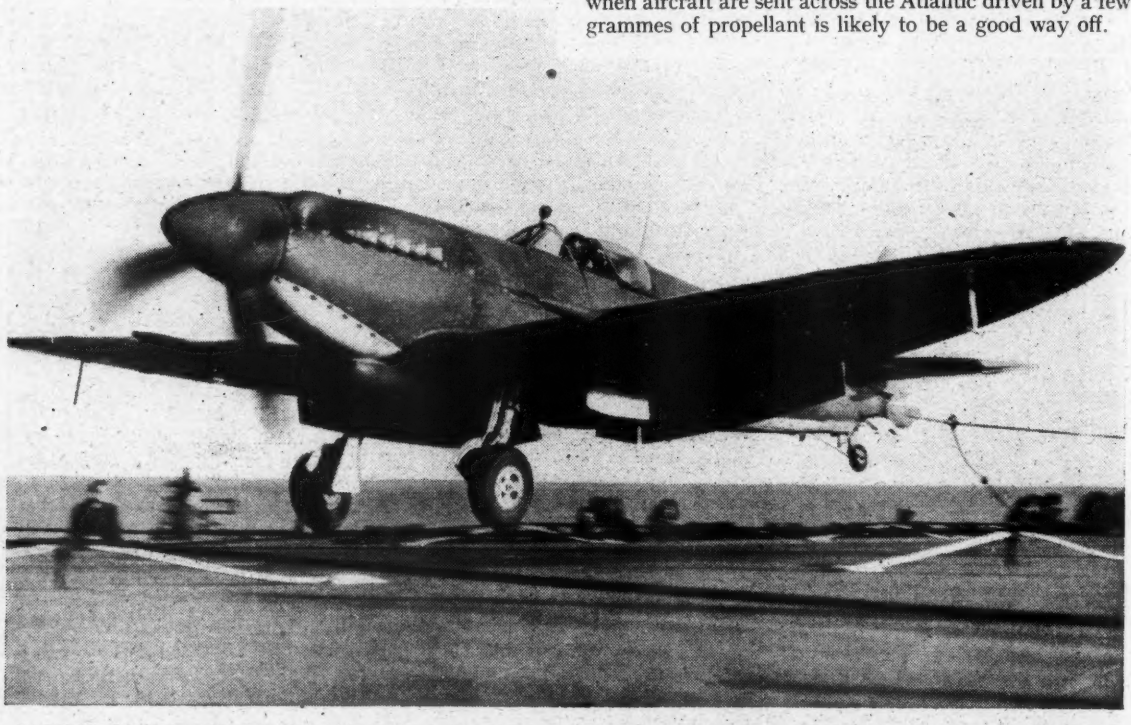
Atomic Energy

IT is but natural that scientists should be careful to point out the potential benefits to mankind which the discovery of means to split the atom may confer, apart from its hideous use for destruction. It is, however, well to guard against unjustified optimism.

Peaceful benefits may in time accrue from the discovery. But it would be well not to jump to conclusions nor to indulge in wishful thinking. To convert the violent explosion into controlled work is a task which may well take several decades. After all, engineers have not yet found it possible to use the relatively feeble explosion of a mixture of oxygen and hydrogen in an internal combustion engine, and cordite so far is only applied to propulsion in the limited sphere of catapulting aircraft. The problems attending the taming of atomic fission must be many times more difficult, and the day when aircraft are sent across the Atlantic driven by a few grammes of propellant is likely to be a good way off.



FASTEST FLEET FIGHTER: A Seafire XV at the moment of landing-on on the flight deck of the *Pretoria Castle*. Note the sting-type arrester hook. A note on the Seafire XV appears on page 181.

The marshalling yards at Chumphon, on the Bangkok-Singapore railway, after attention by R.A.F. Liberators.

WAR in the AIR

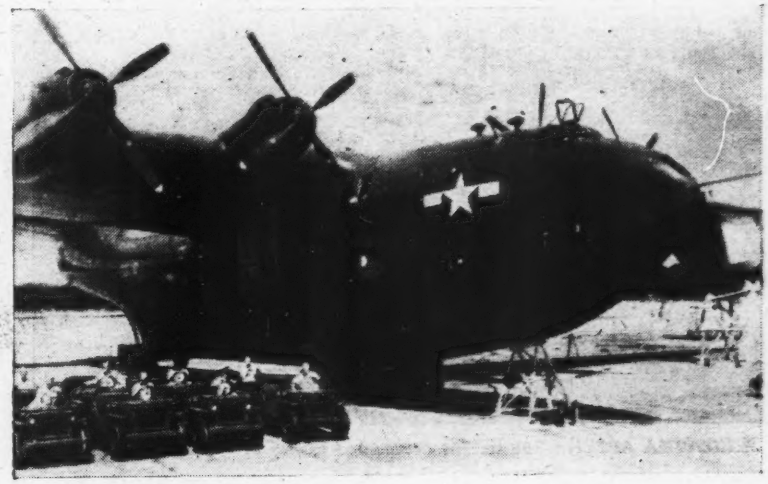
Japan's Collapse : The Atomic Bombs : Russia's Declaration of War : Invasion of Manchuria

JAPAN'S offer to surrender was so sudden that it took most people by surprise. It was the only sensible thing for the Japanese Government to do; but the Japanese do not always do the sensible thing. As we write it is hard to realise that soon no more shots need be fired in anger (except where justice deals with war criminals), no more bombs need be dropped, and no more torpedoes despatched upon their deadly errand. This news comes at the end of a week of surprises. Let us collect our minds and look back at what happened before.

Since VE Day no week has given to the world two such great pieces of news as the dropping of the first atomic bomb on a Japanese city and the declaration of war by Russia on Japan. Either by itself was news of first-class magnitude. Coming so soon one after the other they are staggering, and the rulers of Japan might well feel their minds reeling.

For a considerable time past it has been clear that Japan had no hope of avoiding unconditional surrender. The Allied forces already deployed against her, and being rapidly swollen as the might of America left Europe to assist in wiping the slate clean of the recollection of Pearl Harbour, were sufficient to assure the collapse of Japanese resistance by the ordinary use of sea, land and air power. Only quite recently have the first 4,000 lb. bombs been dropped on the Japanese islands; but already the Japanese fleet had ceased to be a fighting force.

Then came the news of the atomic bomb on Hiroshima, and the whole world was amazed. Nations which feel no apprehension of being involved in war for as long ahead as can be estimated have nevertheless been struck with awe at the fearful possibilities laid before humanity by this new and terrible means of destruction. It is not surprising that Japanese foreign broadcasts began to whine about the inhumanity of using such a terrific instrument of destruction. Bullies are usually prone to whine when they feel themselves beaten. Japan has claimed to be a civilised nation, she has talked about her *bushido* (which we believe means something like chivalry), and she has signed the Geneva Convention. Yet she has fought this war with the utmost barbarity, and so is in the



SHORT-LIVED : The Hawaii Mars, the first of twenty 72½-ton Martin flying boats for the American naval air transport service, which recently crashed on landing. It was launched on July 21st.

WAR IN THE AIR

worst possible position to complain when she now suffers herself.

The sea-air side of the war was strategically settled some time ago; but it did seem that the clearing of Japanese troops out of the mainland of Asia might give the Allies some trouble. A certain number of factories making munitions of war have been established in Korea and Manchuria. The Allies have proved their capacity to make amphibious landings, and they would doubtless have been able to put their armies ashore in China.

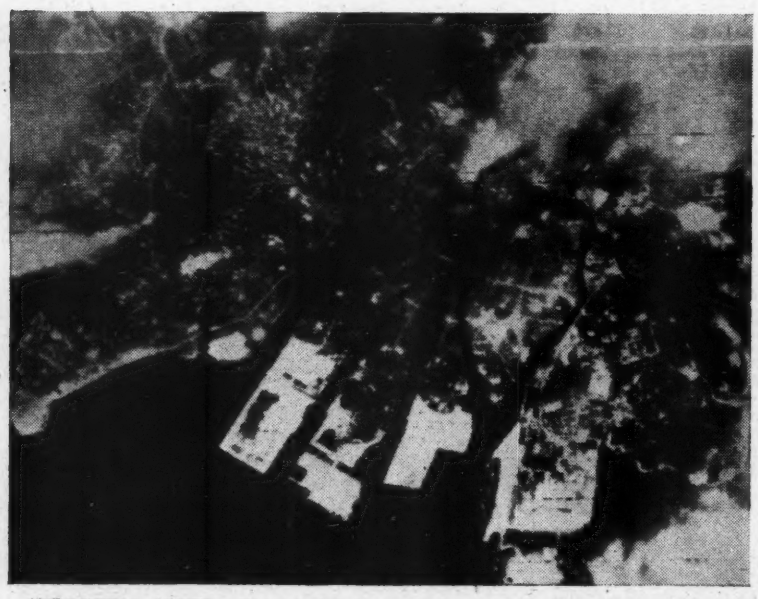
The immediate necessity for such a landing was removed by Russia's declaration of war on Japan. It was an event which was to be expected so soon as Russia had her hands free on her western borders. Not only does it bring the Big Four into line once more as Allies, but it gives the Russians a chance to wipe out the memory of the war of over 40 years ago when she was defeated by Japan. The declaration was promptly followed by an invasion of Manchuria from three sides, and the Russian armies poured forward with the speed which they have taught the world to expect from them. This move might not have made it unnecessary for the Allies to land on the coast; but it would have seriously embarrassed the Japanese commanders on the mainland if they had had to meet attacks from land and sea at the same time.

But before Russia had been at war with Japan for more than 30 hours, the Japanese offered to surrender on terms. Clearly this offer would have been made in any case, after the falling of the second atomic bomb on Nagasaki. But Russian action made assurance doubly sure.

HIROSHIMA BEFORE: A reconnaissance photograph of the Japanese town before it received the first atomic bomb to be dropped.

The Japanese condition was that the authority of their Emperor should not be impaired. The Allies have always proclaimed that their object was to insure that the people of every country which submitted to them should get the form of government which they wanted. It would be illogical to insist that any country must become a republic if its people preferred a monarchy, and so the insistence on unconditional surrender was somewhat modified in their reply. They did not insist on the removal of the Emperor, as if he were a Hitler or Mussolini, but contented themselves with demanding that he must take orders from an American Supreme Commander. In other respects the surrender of the Japanese forces must be unconditional, and the Emperor must issue orders which all Japanese commanders would obey. It is, as a matter of fact, more satisfactory to deal with an established Government than with a chaos in which nobody is quite sure whether the self-styled Dictator has authority to order the surrender of the troops.

Of course the Japanese took some time to consider this demand. No Asiatic ever accepts any offer without an attempt to bargain.



HIROSHIMA AFTER: The terrible devastation caused by the first atomic bomb to be dropped in war

DEATH OF AIR COMMODORE GAYFORD

WE record with regret the death last week of Air Commodore O. R. Gayford, C.B.E., D.F.C., A.F.C., who will be always remembered as the chief pilot of the Fairey monoplane which, in February, 1933, set up a world's long-distance record by flying non-stop from Cranwell to Walvis Bay in South-West Africa, a distance of 5,340 miles. His second pilot was Flt. Lt. Nicholetts. This flight held the world's record until November, 1938, when it was surpassed by the flight of three Vickers Wellesleys, led by Sqdn. Ldr. R. Kellett, from Ismailia to Darwin in Australia.

Gayford enlisted as a rating in the R.N.V.R. in 1914, and was commissioned in the R.N.A.S. as an observer two years later. He won the D.F.C. in 1918. After the first world war he held many posts and had many adventures. In 1944 he retired from the R.A.F., and at the time of his death was Regional Controller for the Eastern Region of the Ministry of Fuel and Power.

HERE AND THERE

M.A.A.F. Disbanded

FIELD MARSHAL SIR HAROLD ALEXANDER, Supreme Allied Commander in the Mediterranean theatre, has announced that the Mediterranean Allied Air Force has been disbanded. The British section will revert to the R.A.F. Mediterranean Command under Air Marshal Sir Guy Garrod.

Boche Brolly

THE current issue of *Air News* tells how, shortly before VE-day, the Germans evolved a new parachute. It had a closed top and was of triangular shape, which features were supposed to reduce the number of accidents, eliminate wide swinging and make dropping more accurate.

College of Aeronautics

THE board of governors of the College of Aeronautics, created in accordance with the recommendations of the Fedden committee for post-graduate instruction in aeronautical science and engineering, has now been appointed.

Air Chief Marshal Sir Edan Ludlow Hewitt has been appointed chairman of the board, the other members being Dr. W. Abbott, Mr. H. Burroughes, Sir Roy Fedden, Mr. J. Ferguson, Brig. Gen. Sir Harold Hartley, Sir William Hildred, Sir Melvill Jones, Dr. E. B. Moullin, Mr. J. D. North, Sir Frederick Handley Page, Mr. R. Relf, Dr. H. Roxbee-Cox, Lord Selkirk, Air Marshal Sir Ralph Sorley, Sir William Stanier, Rear-Admiral T. H. Troubridge, and Mr. W. E. F. Ward.

THE GOLD COAST SQUADRON, of Bomber Command, was recently visited by the Governor of that colony, Sir Alan Burns, and Lady Burns. With them are (left) Group Capt. W. R. Brotherhood, C.O. of the station ; Wing Cdr. W. J. Smith C.O. of the squadron (centre) ; and Air Comdre. J. Silvester, C.O. of the base (right).

To Open Next Year

PRELIMINARY steps are now being taken with a view to opening the college some time next year. This will be in temporary accommodation to be provided at Cranfield pending the establishment, at a later date, of permanent premises.

In the meantime invitations are being extended to the Governments of the Dominions and India, who may wish to associate themselves with the college, to appoint representatives on the board of governors.

Optimism

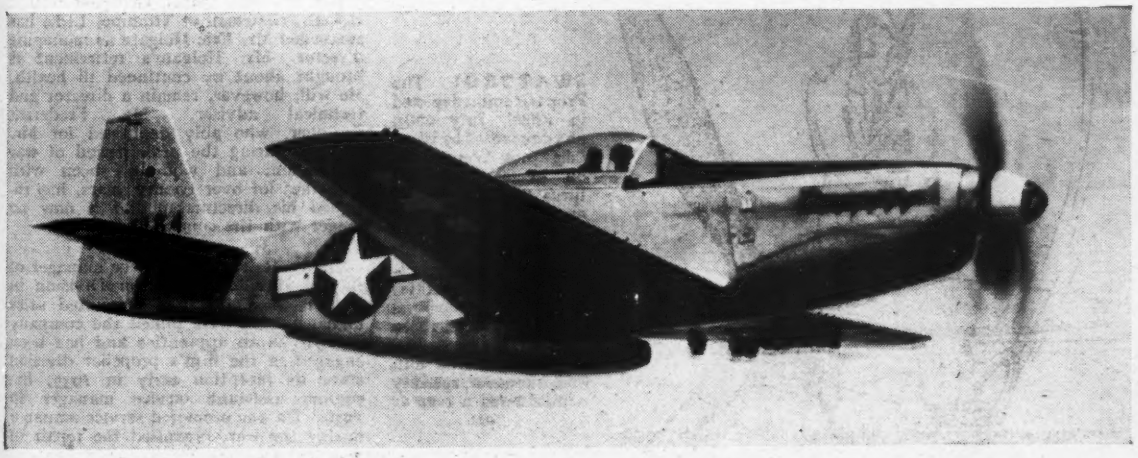
LAST week's terrific news that Allied scientists have at last succeeded in tapping the cosmic energy of the atom inspired Mr. J. Langdon Davies, the *Daily Mail's* scientific scribe, to indulge his lively imagination in what Ian Mackay, of the *News Chronicle*, fittingly described as "a real Bank Holiday romp."

According to Mr. Davies, "the Labour Government need not waste time nationalising the coal industry nor the electric and gas industries, since these industries are, from now on, obsolete, or at least of such altered value that nobody can possibly assess their capital assets." He admits, however, that there is bound to be a bit of a time lag before atomic power supersedes all other forms of power in our everyday lives.

Unbiased View

IN sharp contrast with the above, experts of the National Advisory Committee for Aeronautics in Washington, whose opinions are not coloured by British party politics, have expressed their considered view that "many years of research and development lie ahead" before atomic energy can be converted into controlled power.

They say that the atomic engine is a "distinct possibility," and point out

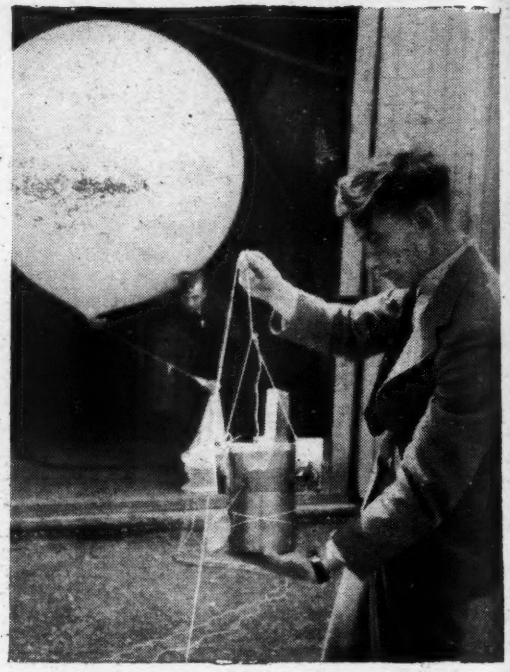


THE P.51H MUSTANG, mentioned on this page in last week's *Flight*, which is powered by a Packard-built Merlin of 2,000 h.p plus, is credited with a top speed of over 460 m.p.h. and increased range and ceiling.

HERE AND THERE

that such a power-unit, by eliminating the need for large and heavy liquid fuel storage, will ultimately revolutionise air transport.

The rosiest forecast we have so far read gave the petrol engine (and other current means of power) at least ten years more useful life before being ousted by the mighty atom. In the meantime it would be rather nice to have some coal for the sitting-room fire o' wintry nights!



RADIO-SONDE—a recent invention for supplying upper-air information for weather forecasts when carried aloft by a small balloon, is fitted with a windmill, driven by conical cups, that operates a switch so that the "gen" is transmitted in a definite sequence.

News in Brief

A DELEGATION of managers, technicians and workers of the French aircraft industry is paying a visit to British factories at the invitation of the British Government.

* * *

Eleven R.A.A.F. schools in Victoria and New South Wales have recently been closed down, it was announced last week by Mr. A. Drakeford, the Australian Air Minister.

* * *

The U.S. Naval Air Cargo Office was to-day transferred from Harrowbeer airport to Exeter. All necessary arrangements with the local R.A.F. authorities have been completed, and construction of facilities is in progress.

* * *

Mr. Peter Masefield, appointed civil air attaché in the U.S. under the recently created Ministry of Civil Aviation, has arrived at the British Embassy in Washington to take up his new duties.

* * *

Mr. R. L. Cumming, who joined Airwork, Ltd., as secretary in 1935, has been elected a member of the board. Wing Cdr. A. D. ("Bats") Page has rejoined the company on his recent release from the R.A.F.

* * *

Air Marshal Sir Arthur Coningham and Air Marshal Sir James M. Robb have been awarded the Distinguished Service Medal by the President of the United States. The decoration is "in recognition of valuable services in connection with the war."

* * *

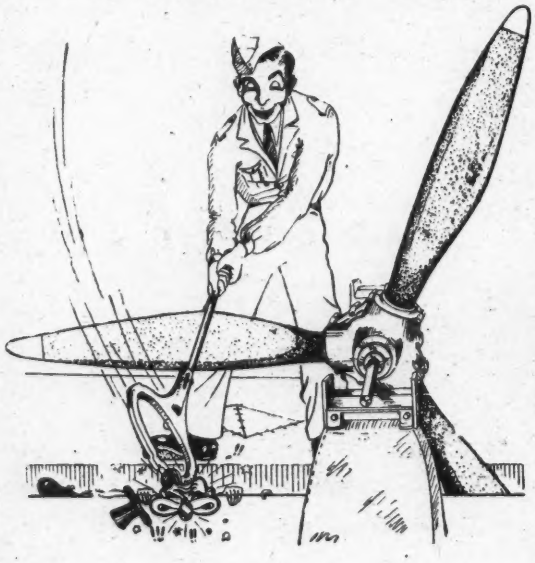
Brigadier General James A. Millison, former Commander of the U.S. 15th Air Force (which operated from Italy), has been named Commanding General, U.S. Army Air Force in the Mediterranean Theatre of Operations. He succeeds Maj. Gen. James M. Bevans, who has been given an undisclosed assignment.

* * *

Moscow radio, quoted by Reuter last week, reported an outstanding performance by a rubber-driven model aircraft during experiments at Novosibirsk, Siberia. The model stayed in the air for 26 min. 41 sec., during which it covered over four miles and reached a height of 7,600ft. Unfortunately, no constructional details were given.

* * *

The American 10th Air Force, veterans of the India-Burma campaign, will be added to the newly organised U.S. Army Air Force in the China theatre under the command of Lt. Gen. George Stratemeyer, Maj. Gen. Albert Wedemeyer, Commander of U.S. Forces in China, announced in a message from Chungking last week.



SWATTED! The Propa Gremlin depicted in *Flight*, July 26th, and discovered by Wing Cdr. Jock West while on overseas service, turns out to have been an emigrant from a home-based family of the little pests. This cartoon from de Havilland's "Technicalities Without Tears" shows that the back-room boys at Hatfield had also encountered him and, moreover, speedily administered a *coup de grace*.

Metal Sections, Ltd., a subsidiary of Accles and Pollock, Ltd., has been formed at Oldbury (Staffs) to handle the increased business in cold rolled metal sections, but will still have at its disposal the parent company's technical resources. Mr. L. Gibbs, who has been in charge of production in the past, will continue as works manager of the new company with Mr. E. Bryan as sales manager.

* * *

A North-Western Fuel Luncheon Club has been formed in Manchester on similar lines to the one in London, and Sir Frederick West has accepted the invitation to be its first president. Monthly luncheons (to be followed by a half-hour address by a prominent speaker on varied subjects of interest to the fuel industries) are to be held, and the first has been provisionally fixed for October.

* * *

Admiral Sir Lionel George Preston, K.C.B., chairman of Titanine, Ltd., has succeeded Mr. Eric Holgate as managing director. Mr. Holgate's retirement is brought about by continued ill health. He will, however, remain a director and technical adviser. Mr. Frederick Grainger, who ably deputised for Mr. Holgate during the peak period of war production, and who has been with Titanines for over twenty years, has resigned his directorship and is now no longer with the company.

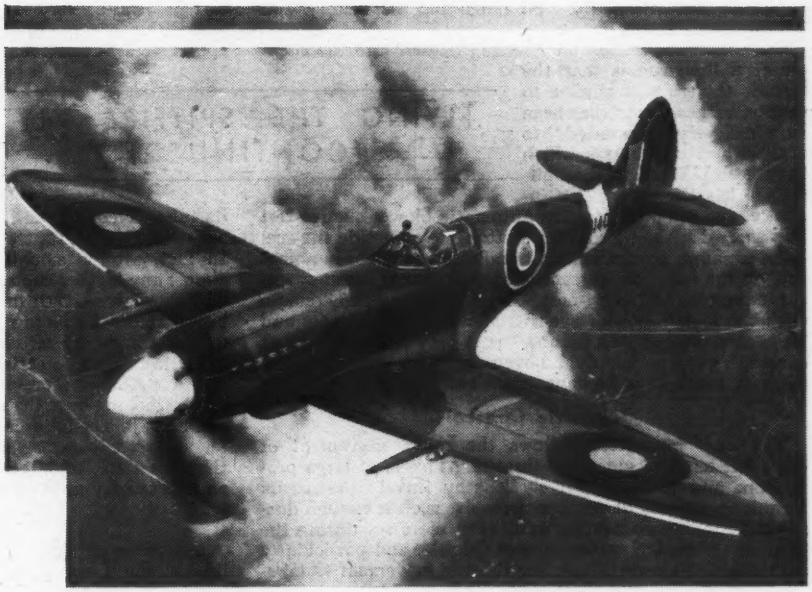
* * *

Mr. C. R. Burgess, service manager of the de Havilland Propeller Division in Britain, has now been appointed sales manager also. He joined the company in 1928 as an apprentice and has been engaged in the firm's propeller division since its inception early in 1935, becoming assistant service manager in 1936. He was promoted service manager during the war, organised the repair of D.H. and Hamilton propellers for the European campaign, and served as repair co-ordinating officer under M.A.P., a duty which took him overseas.

Flying the Spitfire XIV

A Few Impressions of One of the Later Spitfire Marks: The War's Ever-young Veteran: Maintaining Consistent Handling Qualities with Quantity Production

By "INDICATOR"



ALTHOUGH the impetus of war has probably had a more marked effect on aeronautical than on any other engineering development, it is as well, sometimes, to remember that this impetus has merely *hurried* progress—and that not always in the right direction. Because more concentrated effort and expenditure has been possible, progress, at least along certain lines, has been more rapid than it would otherwise have been.

Some of the best and most useful types were largely or entirely developed during the years of peace, and, though it is not suggested that the likelihood of war did not accelerate progress, the basic knowledge was available, and this knowledge would undoubtedly have been applied to the design of civil and military types in due course. Without delving deeply into the history of the different firms, and of the persons concerned with these firms, it would be impossible to produce an accurate list of outstanding military aircraft which were actually planned, and even experimentally flown, before the outbreak of war, but a few can safely be mentioned.

From the point of view of British survival, the most important, of course, were the Hurricane and Spitfire. The former, I believe, is still doing good work in the Far East, though, after an almost incredible lease of life when loaded with cannons, bombs, rockets and extra tanks, it can now be considered as obsolescent. The latter, in vastly different form, but basically the Spitfire of 1938, is still going as strongly as ever. With twice its original power and nearly twice its early performance, it has lost few, if any, of its original favourable flying characteristics. Among the few other aircraft which, I believe, were flying before the European war and which were still being used in basically the same form for front-line operations at its termination, are the Douglas Boston (an outstandingly good aircraft from the handling point of view), the Junkers 88, and, if one can allow such extreme changes as have been made in layout and armament, the Boeing Fortress. But the Spitfire holds a big lead in length of active service on any.

Not that one would suggest for a moment that the Spitfire XIV is merely a Spitfire I with more power and equipment. Gradual detailed development has made it vastly different, but the "shape," structure and, most important of all, the handling qualities have remained much the same. The pilot of the I or II might find the XIV something of a handful for a start, with its long nose, increased power and greater all-up weight, but he would soon accustom himself to the differences and would recognise the essential "Spitfireness" of the ensemble. A few circuits would convince him that its somewhat savage and purposeful look, in comparison with the concealing elegance of earlier marks, is a camouflage for a set of comparatively mild habits.

Nevertheless, there might have been some justification for the re-naming of the type with the introduction of the XIV. The additional power of the Griffon engine, and the fact that it turns round the other way with a somewhat marked torque effect, makes both this and subsidiary marks "feel" different—particularly while on and near the ground. The majority of pilots, as they climb out of their first XIV after a long experience of the earlier marks, are inclined to say: "Nice, fast, handleable flying machine—but it ain't a Spitfire no more. . . ." Since Merlin-engined VIIIs, IXs and XIs were, and still are, in action on the fighting fronts, a change of name would still have left the Spitfire with the honour of being the war's ever-young veteran.

Marks and Engines

For the assistance of those who have no reason to be *au fait* with the somewhat bewildering series of marks in the Spitfire series—and for whom, perhaps, the use of Roman numerals involves a series of calculations rather after the manner of those needed in translating twenty-four-hour-clock times to ancient English—it might be as well to sort out some of the later types in so far as the censor will permit. Excluding the little-used or obsolescent marks, the Seafire III, and the Spitfire V, VII, VIII, IX, XI and XVI are all Merlin-engined. Engine mark numbers have reached such heights that the Roman method of numerology has had to be discontinued, and we can say that they are powered, variously, and according to their age and uses, with Merlin 45, 55, 61, 63, 64, 66, 70, 71 and 266—which last is merely the Packard-built 66 fitted to the XVI, and which, again, is merely a variation of the IX. The VII and XI are P.R.U. types, and the VIII is, curiously enough, an "advanced" form of the IX, with retractable tail-wheel and various other refinements. The apparent numerical inconsistency was caused by produc-

D

tion arrangements. Of the Griffon-engined marks, the first to appear was the XII—a low-level fighter with clipped wings It has a four-bladed airscrew. Then there is the XIV, characterised by a five-blader and a long nose to accommodate the two-stage, two-speed blower and intercooler of the Griffon 65. So much for the history and development lesson.

One's first impression on lowering oneself into the cockpit of a Fourteen is that the layout, though still similar to that on earlier marks, has been more seriously "organised" to deal with all the extras which have been piled on to the Spitfire during the war. For instance, the radiator flap and automatic blower-change test buttons, with the oil dilution button, lie alongside the fuel booster pump, navigation light and other switches in a neat row on the left, but, in such a comparatively small space, the impression of "busy-ness" must still necessarily remain with the installation of such items as gyro gun-sights and large-capacity priming pumps. It is only remarkable that everything can be found, and even seen with the naked eye, when so much must be confined in such a small space.

FLYING THE SPITFIRE XIV (CONTINUED)

Throttle Control

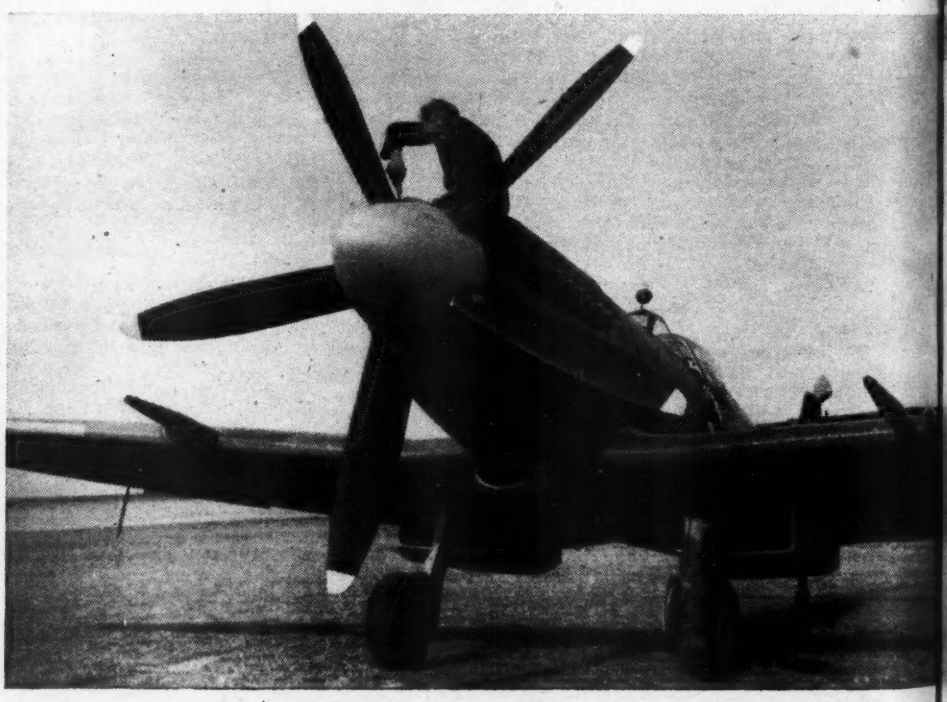
The next impression follows the reflex movement of one's left hand to grasp the throttle. This is of large proportions and with a relatively lengthy travel; the reason for this apparently disproportionate size is clear enough during the running up process and, even more so, during the take-off. With the earlier type of throttle, and particularly with cropped-blower Fives, the throttle movement to take-off boost was on the short side. This would never do in an aircraft with a critical run-up maximum and with such powerful torque effects during the later stages of the take-off. But a small fortune in Koffman cartridges must have been wasted by newcomers who did not realise that the throttle should be set for starting some two inches along the quadrant. Starting, as a matter of interest, is a first-time affair, hot and cold, to the pilot who knows his Fourteen and is prepared to be really generous with his throttle, both before and after releasing the cut-out.

Few aircraft are blessed with such a simple take-off "drill" as the Spitfire. "Trim, flaps, fuel and airscrew" cover the essentials, and, with automatic inter-connected c.s. controls, even the last can be safely forgotten, while no one could be so blind as to leave the flaps down after ground-test since, from the very early days, there have been mechanical flap indicators to make a virtue of a mechanical necessity. The mixture, of course, is fully automatic with the Bendix-Stromberg carburettor, the radiator gills are automatically operated, and there is no real need of the fuel booster pump's assistance in normal conditions. "T for Trim" is, however, of moderate importance, particularly as, in contrast to the Merlins, the Griffon swings the aircraft to starboard somewhat smartly during the earlier stages of take-off. So the order of the day is full port bias and, to remove all possibility of touching the airscrew tips, neutral or very slightly nose-heavy elevators.

And this is where the big throttle movement is thoroughly appreciated. Provided that the throttle is opened with reasonable circumspection and that the left foot is ready to exert plenty of initial pressure—assisted by a servo tab on the rudder—there is no reason at all why the Fourteen should deviate in the slightest from its take-off course, and, once the boost is well up and the outfit under full sail, the tendency to swing is unnoticeable. In fact, after a smooth opening up to, say, zero boost, almost any further supply of power can be fed to the Griffon without personal hardship. The only reason for limiting the boost before becoming airborne is to save precious tyre rubber. Since, by virtue of torque reaction, the Fourteen, while taking off, is certainly not going where it is pointing and something, therefore, must be giving way when one can be looking over the starboard side down a clear runway while the beautifully cowled nose may be heading quite a few degrees to port. Obviously the tyres are balancing the difference, and it behoves one to use as little boost as is necessary so that this difference may be small.

Boost and Climb

I have no available figures (even if these could be published), but I would say that the Fourteen, in spite of its greater all-up weight, clambers skywards at its rated boost of 9 lb. as fast as the Nine does at its rated 12 lb.—and there is always a further 9 lb. in reserve for reasonably short periods. Fighter climbing rates have become so preposterous nowadays that the figures are beginning to look like those for national debts. It will be sufficient to say that, at the recommended climbing boosts and speeds of modern fighters, most of one's weight appears to be taken on the back of the seat! While weaving tortuously through the dangerous maze of unpublishable figures, we might endea-



The closely cowled Rolls-Royce Griffon engine on the Spitfire XIV and its five-bladed Rotol airscrew.

With the exception of the longer nose, the Spitfire XIV retains all the familiar delicacy of the previous Spitfires.

vour to satisfy inevitable curiosity in the matter of speeds with the use of a few vague and harmless statements. At a fairly low cruising boost the Fourteen rumbles quietly along at an A.S.I. figure of very little short of 300 m.p.h.; at one critical height (not necessarily its best) a little slide-rule manipulation based on actual A.S.I. readings, position error and height, shows the maximum to be a lot better than 410 m.p.h. T.A.S. That, I think, will be enough of figures for the present. One day, when the last of the King's enemies has been confounded, we shall be able to relax in such matters.

Subcontraction and Controls

One of the many difficulties in the quantity production of fast aircraft has been concerned with the tolerances and consequent differences in the items made separately by different firms all over the country. Minor variations must be expected, and these variations can make considerable differences where control surfaces are concerned. There was a period when production Spitfires from some quarters were tending to show a heavying-up of the ailerons. No doubt the reasons for this were fully understood and inescapable at the time, and the tendency did not develop, but, remembering the characteristics of the intermediate marks, it seemed to be a pity. This trouble never appears to have affected the Fourteen, though some others, inevitable at modern diving speeds, had to be combated in the course of production testing. Indeed, the later variety of clipped-wing F.R. Fourteen must have almost the nicest lateral control of any fighter type—which, when we remember the varied sources of wartime dispersed production, is a very remarkable thing. And a Spitfire's ailerons are never spoilt in the course of trimming aljustments, since these are always made by "dressing" the trailing edges and shrouds.

Delight to Aerobat

Consequently, the Fourteen is a delight to aerobatically inclined. Even my own somewhat pedestrian repertoire is carried through with few blush-making divergencies from the ideal path, though, because of the considerable changes of directional trim with varying speeds and boosts, one needs to be rather careful with the rudder. Earlier marks have a plain adjustable tab on the rudder, which is on the heavy side; consequently, in the intervals between one's use of the bias adjustment, one can afford to apply continuous or heavily increasing pressure without causing any very violent results. The Fourteen has a large adjustable tab which is, at the same time, of the automatic-servo type, and allowance must be made for this when instinctively correcting yaw. A heavy pressure, too continuously applied, may cause a slight over-correction—pedal reflexes being what they are. Knowing little of the test and production history of the Fourteen, I am prepared to be corrected when I suggest that almost its only handling fault concerns the slightly excessive power of this servo tab. Maybe this is the price which must be paid for take-off ease, but, particularly when diving in very bumpy weather, it is sometimes difficult to prevent the aircraft from weaving about through small angles. And the Fourteen certainly does go downhill with no mean acceleration—to the delight of those on the ground with an ear for that particular kind of music. When going really fast, it is advisable to use a c.s. setting slightly below the maximum permissible (2,750 to 2,775 r.p.m.) since, if the airscrew is not perfectly matched to suit the particular airframe and engine, an uncomfortable vibration may be set up. A slight reduction of the revolutions being obtained will usually smooth everything out in cases where this tendency appears.

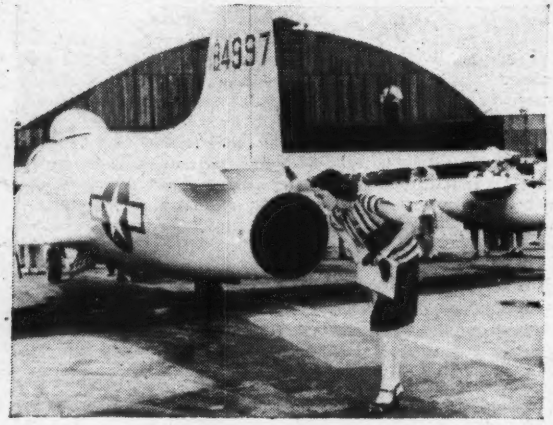
Near the Stall

The Fourteen appears to possess all the excellent slow-flying characteristics of the earlier marks. Its rate of sink near the stall is greater, but it still settles down in the magnificent level-keel manner which must have saved dozens of lives. Because of its greater all-up weight its "mushing" tendency with any over-violent elevator movement at low speeds and small throttle openings is more pronounced, but the "mush," again, is dead-level, and, if not caught on the throttle in time, results merely in a heavy landing. The stall may or may not be accompanied by buffetting—depending, apparently, on the state of the wing-root fillet—but seems to be quite harmless, unless energetically encouraged to be otherwise. Which is again rather surprising.

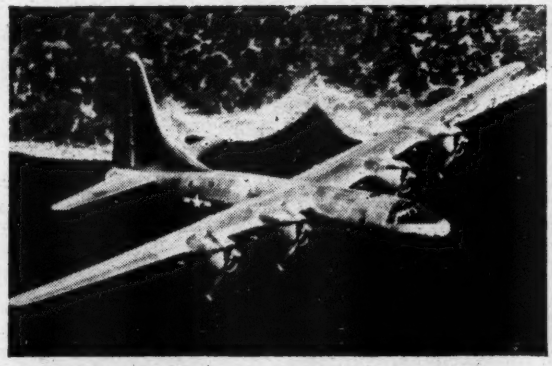
During the approach the forward view is a trifle less adequate than that of previous marks, but every Spitfire pilot develops his own method of providing himself with the necessary view—either by holding a slight skid, by arriving in a continuous turn (when airfield conditions permit), or merely by maintaining excessive speed until the last moment. A motoring approach at 95 m.p.h. may look good in print and is perfectly safe from an aerodynamic viewpoint, but it is uncomfortable—though I know of few aircraft which give one such a powerful sense of safe control while arriving, more or less solely on a sense of "feel," in this manner. I'm merely psychologically disinclined to land on something that I can't see clearly until the last possible second, so I prefer to hurry all the way in, nose well down and throttle well back—and the whole world in view of the top cowling. Once on the ground, of course, several feet of broad cowling is an impediment to one's view, as one weaves and rubber-necks through a boulder-strewn dispersal. But it is curious how, both on the ground and in the air, one learns, with different types of aircraft, how and where to look in order to see everything.

However good the Spiteful series may be, very many pilots will be sorry when the Spitfire finally fades into obsolescence.

NEWS IN VIEWS



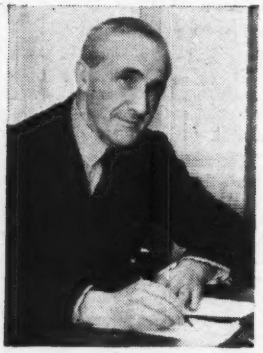
AND IT COMES OUT HERE. An amateur girl-pilot inspects the business end of a Lockheed P-80 Shooting Star's jet propulsion unit when this aircraft was publicly displayed at the U.S. National Airport at Washington, D.C. An air-intake on each side of the cockpit just in front of the wing-roots feeds the compressor, and the whole jet-unit can be removed in a quarter of an hour. Reported top speed of the P-80 is over 570 m.p.h.



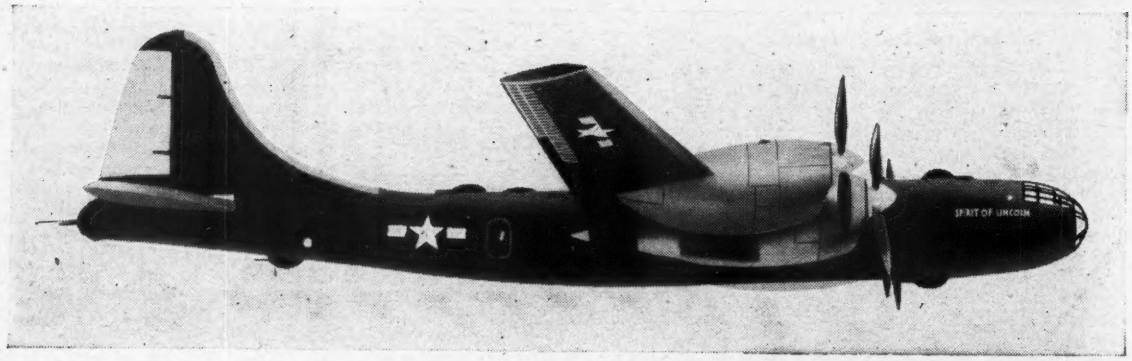
(Above) The lofty 32ft. fin and rudder of the B-32 Dominator, together with its abnormally high aspect-ratio wing of 135ft. span, will make errors in identification unlikely in Pacific operations.

(Left) Mr. John Wilmot, the new British Minister of Supply and Aircraft Production.

(Below) The C-69 Constellation of the U.S. Air Transport Command taxies in at the end of its record flight from New York to Paris in 14hr. 12min. From La Guardia airport to Orley air base on the outskirts of the French capital is 3,660 miles.



The New Secretary of State for Air in the Labour Government, Viscount Stansgate.



THE BOEING XB-39, illustrated here, will be recognised as a B-29 Superfortress experimentally fitted with four 2,600 h.p. Allison V-3420 liquid-cooled 24-cylinder engines recently reported to have been withdrawn from production.

Atomic Fission

Mr. Churchill's Statement on the History of the Evolution of the New Bomb

ALTHOUGH the world-shaking advent of the atomic bomb has already been dealt with very fully by the daily press, each organ in its own way and according to its own lights, we feel that the statement by Mr. Churchill, written before the change of Government and couched in his own inimitable style, should be placed on record so that the part which this country played in the development may not be forgotten. Following is Mr. Churchill's statement:—

By the year 1939 it had become widely recognised among scientists of many nations that the release of energy by atomic fission was a possibility. The problems which remained to be solved before this possibility could be turned into practical achievement were, however, manifold and immense; and few scientists would at that time have ventured to predict that an atomic bomb could be ready for use by 1945. Nevertheless, the potentialities of the project were so great that His Majesty's Government thought it right that research should be carried on in spite of the many competing claims on our scientific manpower. At this stage the research was carried out mainly in our Universities, principally Oxford, Cambridge, London (Imperial College), Liverpool and Birmingham. At the time of the formation of the Coalition Government, responsibility for co-ordinating the work and pressing it forward lay in the Ministry of Aircraft Production, advised by a Committee of leading scientists presided over by Sir George Thomson.

At the same time, under the general arrangements then in force for the pooling of scientific information, there was a full interchange of ideas between the scientists carrying out this work in the United Kingdom and those in the United States.

Four Years Ago

Such progress was made that by the summer of 1941 Sir George Thomson's Committee was able to report that, in their view, there was a reasonable chance that an atomic bomb could be produced before the end of the war. At the end of August, 1941, Lord Cherwell, whose duty it was to keep me informed on all these and other technical developments, reported the substantial progress which was being made. The general responsibility for the scientific research carried on under the various technical committees lay with the then Lord President of the Council, Sir John Anderson. In these circumstances (having in mind also the effect of ordinary high-explosive which we had recently experienced), I referred the matter on August 30th, 1941, to the Chiefs of Staff Committee in the following minute:—

"General Ismay for Chiefs of Staff Committee.

"Although personally I am quite content with the existing explosives, I feel we must not stand in the path of improvement, and I therefore think that action should be taken in the sense proposed by Lord Cherwell, and that the Cabinet Minister responsible should be Sir John Anderson.

"I shall be glad to know what the Chiefs of the Staff Committee think."

The Chiefs of the Staff recommended immediate action with the maximum priority.

It was then decided to set up within the Department of Scientific and Industrial Research a special division to direct the work, and Imperial Chemical Industries, Limited, agreed to release Mr. W. A. Akers to take charge of this Directorate, which we called, for purposes of secrecy, the Directorate of "Tube Alloys." After Sir John Anderson had ceased to be Lord President and became Chancellor of the Exchequer, I asked him to continue to supervise this work, for which he has special qualifications. To advise him, there was set up under his chairmanship a Consultative Council composed of the President of the Royal Society, the Chairman of the Scientific Advisory Committee of the Cabinet, the Secretary of the Department of Scientific and Industrial Research and Lord Cherwell. The Minister of Aircraft Production, at that time Lord Brabazon, also served on this Committee. Under the Chairmanship of Mr. Akers there was also a Technical Committee on which sat the scientists who were directing the different sections of the work, and some others. This Committee was originally composed of Sir James Chadwick, Professor Peierls, and Drs. Halban, Simon and Slade. Later it was joined by Sir Charles Darwin and Professors Cockcroft, Oliphant and Feather. Full use was also made of University and industrial laboratories.

Anglo-American Co-ordination

On October 11th, 1941, President Roosevelt sent me a letter suggesting that any extended efforts on this important matter might usefully be co-ordinated or even jointly conducted. Accordingly all British and American efforts were joined and a number of British scientists concerned proceeded to the United States. Apart from these contacts, complete secrecy guarded all these activities and no single person was informed whose work was not indispensable to progress.

By the summer of 1942 this expanded programme of research had confirmed with surer and broader foundations the promising forecasts which had been made a year earlier, and the time had come when a decision must be made whether or not to proceed with the construction of large-scale production plants. Meanwhile, it had become apparent from the preliminary experiments that these plants would have to be on something like the vast scale described in the American statements which have been published to-day.

Great Britain at this period was fully extended in war production and we could not afford such grave interference with the current munitions programmes on which our warlike operations depended. Moreover, Great Britain was within easy range of German bombers, and the risk of raiders from the sea or air could not be ignored. The United States, however, where parallel or similar progress had been made, was free from these dangers. The decision was therefore taken to build the full-scale production plants in America.

In the United States the erection of the immense plants was placed under the responsibility of Mr. Stimson, United States Secretary of War, and the American Army administration, whose wonderful work and marvellous secrecy cannot be sufficiently admired. The main practical effort and virtually the whole of its prodigious cost now fell upon the United States authorities, who were assisted by a number of British scientists. The relationship of the British and American contributions was regulated by discussion between the late President Roosevelt and myself, and a Combined Policy Committee was set up.

The Canadian Government, whose contribution was most valuable, provided both indispensable raw material for the project as a whole and also necessary facilities for the work on one section of the project which has been carried out in Canada by the three Governments in partnership.

The smoothness with which the arrangements for co-operation which were made in 1943 have been carried into effect is a happy augury for our future relations and reflects great credit on all concerned—on the members of the Combined Policy Committee which we set up; on the enthusiasm with which our scientists and technicians gave of

ATOMIC FISSION

their best—particularly Sir James Chadwick, who gave up his work at Liverpool to serve as technical adviser to the United Kingdom members of the Policy Committee and spared no effort; and not least, on the generous spirit with which the whole United States organisation welcomed our men and made it possible for them to make their contribution.

By God's mercy British and American science outpaced all German efforts. These were on a considerable scale, but far behind. The possession of these powers by the Germans at any time might have altered the result of the war, and profound anxiety was felt by those who were informed. Every effort was made by our intelligence service and by the Air Force to locate in Germany anything resembling the plants which were being created in the United States. In the winter of 1942-1943 most gallant attacks were made in Norway on two occasions by small parties of volunteers from the British Commandoes and Norwegian forces, at very heavy loss of life, upon stores of what is called "heavy water," an element in one of the possible processes. The second of these two attacks was completely successful.

The whole burden of execution including the setting-up of the plants, and many technical processes connected therewith in the practical sphere, constitutes one of the greatest triumphs of American—or indeed human—genius of which there is record.

Moreover, the decision to make these enormous expenditures upon a project which, however hopefully established by American and British research, remained nevertheless a heartshaking risk, stands to the everlasting honour of President Roosevelt and his advisers.

It is now for Japan to realise in the glare of the first atomic bomb which has smitten her, what the consequences will be of an indefinite continuance of this terrible means of maintaining a rule of law in the world.

This revelation of the secrets of nature, long mercifully withheld from man, should arouse the most solemn reflections in the mind and conscience of every human being capable of comprehension. We must indeed pray that these awful agencies will be made to conduce to peace among the nations, and that instead of wreaking measureless havoc upon the entire globe they may become a perennial fountain of world prosperity.

Multi-point Injection

The S.U. Company's Contribution to Direct Fuel Injection

THE injection of fuel by means of a pump into the induction system of an engine instead of the use of a carburettor is, of course, an old story. It is used in diesel engines, and the Germans employed it on their petrol engines in this war, the pumps used being basically similar to those of earlier diesel engines. In this country we remained faithful to the carburettor for a long time, but ultimately the various drawbacks of the suction-type of carburettor made development of direct-injection systems advisable

Two main systems of injection are available. In the simplest form fuel is delivered to the entry of the supercharger in a single stream. In the second system the fuel is delivered to the individual cylinders of the engine. Each system has certain advantages. The first scores in the matter of simplicity, while in the second a better and more even distribution to the cylinders may be achieved. This does not usually present much difficulty in supercharged engines, but in naturally-aspirated engines it is not always possible to ensure that each cylinder gets exactly the same uniform charge as the others.

The original designs for fuel injection pumps emanating from the S.U. Carburettor Co. visualised a valving system whereby the fuel could be distributed to the individual cylinders or inlet ports of the engine. At the time when these were first submitted to the Air Ministry and to leading engine manufacturers in this country the principles of individual or multi-point injection were, however, considered somewhat too advanced, and it was suggested that, as a matter of immediate policy, the simpler single-point injection system should be first developed. The original designs were, therefore, modified by the elimination of the fuel distributing provisions, and the outlets of the various plungers in the pump were taken to a common delivery point.

The pump evolved was the basis of the single-point injection pump now in large-scale use on the Merlin engine. More recent developments in the direction of multi-point injection have constituted, therefore, a reversion to a design approximating to the original, as covered by two British patent specifications.

A perusal of the patent specifications shows that the basic principle in question involves the use of a number of plungers of variable stroke, the number being equal to half the number of cylinders to be supplied. The pump is driven at crankshaft speed, and the arrangement is, therefore, such that, where a four-cycle engine is to be supplied, one plunger can be employed to supply each of a pair of cylinders alternately. The distributing gear, which is the novel and essential feature of this pump, is such that this result is achieved with great simplicity.

So far as the control gear is concerned, as also the means by which these plunger strokes are varied to suit the fuel requirements of the engine, this is identical in construction with that employed on the single-point injection pump.

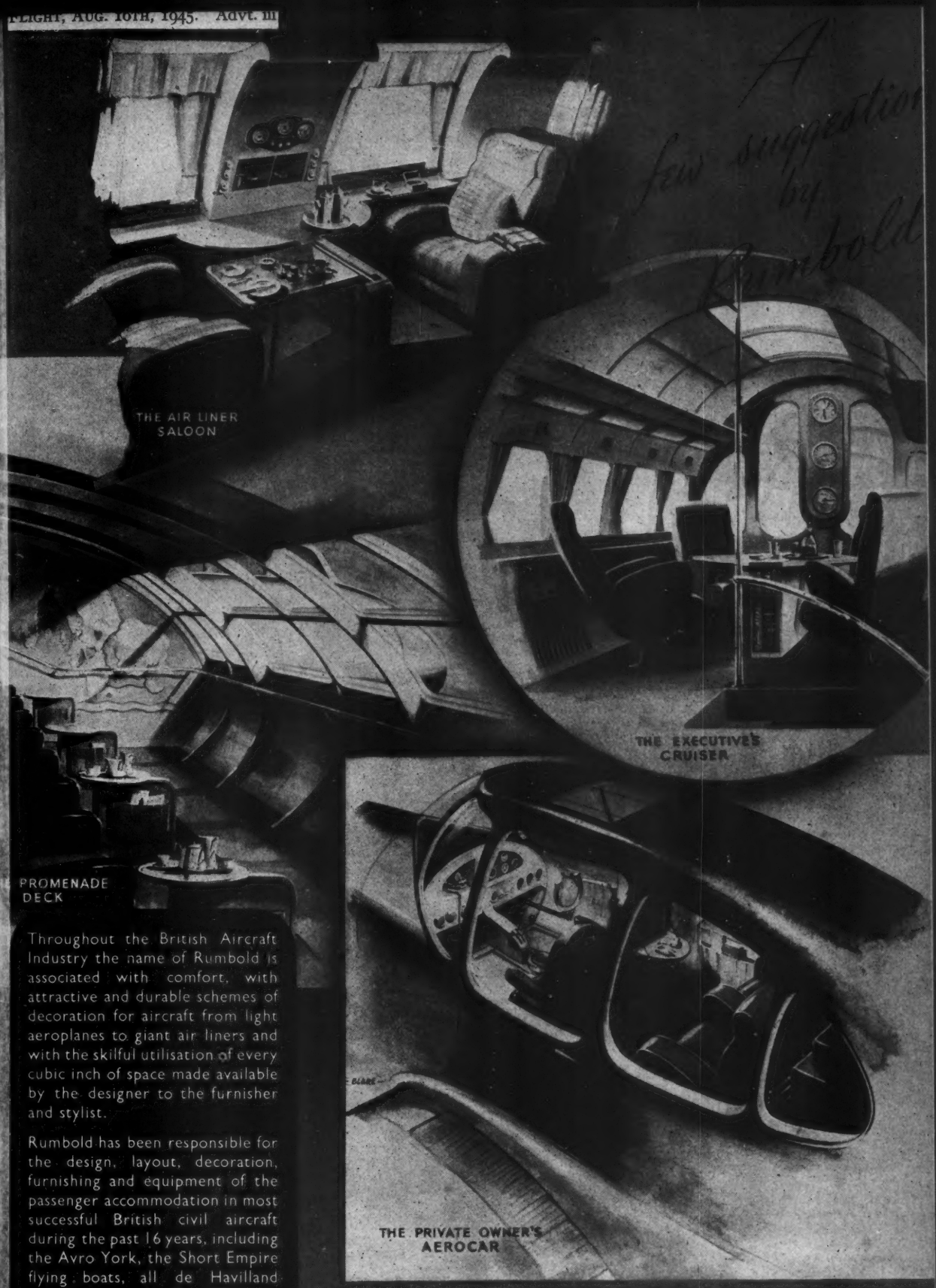
The S.U. multi-point injection pump differs from the German type principally in that the injection pressure is substantially lower and the injection period considerably longer, corresponding approximately with the period of induction of air into the cylinder.

So far as the technical aspects of the two systems of injection are concerned, the matter has been, for some time past, somewhat controversial. Certain developments in the composition of aircraft fuels of recent years have, however, provided additional arguments in favour of the multi-point injection system. Tetra-ethyl lead and certain further additives which it is generally necessary to include are not readily vaporised and there is, therefore, a pronounced tendency for them to be badly distributed as between the various cylinders. The result of this upon engine durability can be very serious, as excessive quantities of these fuel additives lodging in one particular cylinder deprive others of their due proportion of the tetra-ethyl lead, and thus of the anti-detonative properties intended.

The net result is that, particularly under partial load conditions in the case of a supercharged engine, and under all conditions in the case of a non-supercharged engine, some cylinders may be subject to rapid deterioration due to excessive quantities of the lead compound; others may suffer due to excessive admission of the additives associated with the lead compound, which is not necessarily maldistributed in the same manner and, finally, some of the cylinders may be subjected to detonation due to relative absence of the lead compound.

The above phenomena have recently caused some concern to engine manufacturers, and intensive development work is now proceeding in the direction of multi-point injection. Certain alternatives are available in the matter of the exact mode of injection employed. The fuel may be injected directly into the cylinder or into the inlet ports in the vicinity of the inlet valves.

In conclusion, it would appear reasonable to predict further intensive development of this multi-point direct injection system, since the addition of tetra-ethyl lead has become accepted as an essential on all modern high-performance aircraft engines.



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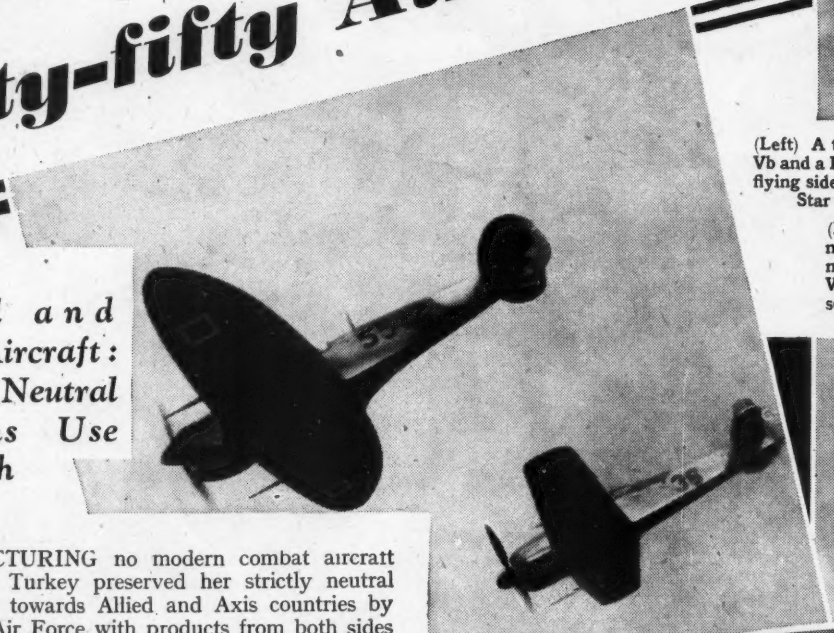
Fifty-fifty Air Force

Allied and German Aircraft: Turkey's Neutral Squadrons Use Both



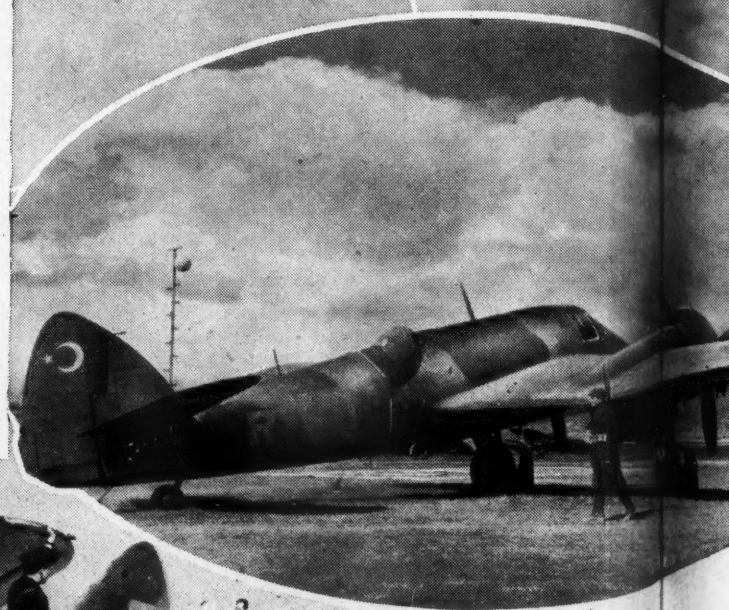
(Left) A tropicalised Spitfire Vb and a Focke-Wulf Fw 190 flying side-by-side under the Star and Crescent.

(Right) A flight of three more Spitfires of the same mark in formation over Western Turkey. Note the square markings under the wings.

MANUFACTURING no modern combat aircraft herself, Turkey preserved her strictly neutral attitude towards Allied and Axis countries by equipping her Air Force with products from both sides of the fence. American, British and German aircraft of various types were purchased as required but subject to their being available. So far as is known, there is no definite ratio of Allied to Axis types represented among the Turkish squadrons; indeed, it would probably have been quite impossible, for a number of reasons, to adhere to any fixed ratio. It is probable, however, that a broadly fifty-fifty basis was aimed at, subject to other over-riding considerations, such as the needs of the Service and respective availability.

It is worth recalling, incidentally, that Britain supplied a number of Hurricane fighters to the Turkish Air Force at the time of the Battle of Britain when we could ill afford to spare a single machine of this type.

During the present war, a number of Turkish student-pilots were sent to Great Britain and to the United States for flying training.



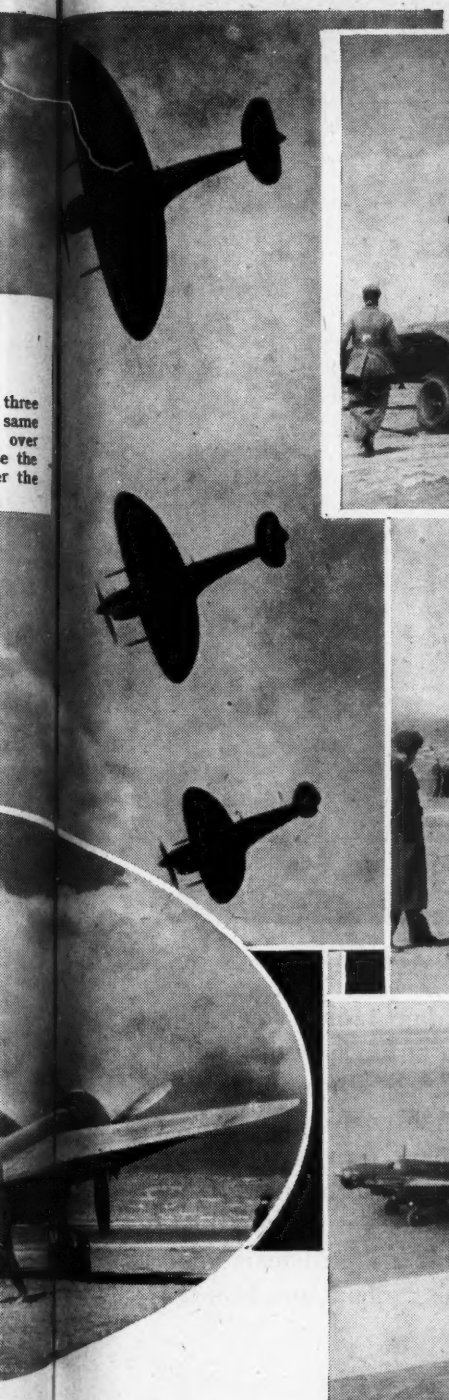
(Above) This Bristol Beaufighter I, with its probably used as a fighter-bomber, and before they obtained Spitfire

(Left) This Airspeed Oxford being wheeled is one of several trainer types in use, Magister, Curtiss-Wright CW-22, Gotha Go Fw 58 "Weihe," and the D.H. Dragon for navigational training. In the Turkish flying training is carried out in gliders. Pre- is also given by the Turkkusu Association very similar in function to our ow

A Turkish Air Force Spitfire, also the tropicalised Vb, being made ready. The pilot, recognisable by his 'chute, can just be seen behind the wing.

A Westland Lysander, still the standard Army Co-operation type in the Turkish Air Force, with a Liberator II and the ubiquitous Jeep.

An early type Heinkel He III, formerly their standard heavy bomber, which is apparently still in use despite the acquisition of the Liberator III (sans Emerson nose turret). The Baltimore III replaced the Bristol Blenheim in the medium bomber class.



eaufighter I, with its camouflage, was ghter-bomber, and as a day-fighter hey obtained Spitfires.

xford being wheeled out by trainees, iner types in use, including Miles t CW-22, Gotha Go 145, Focke-Wulf e D.H. Dragon for photographic and In the Turkish Air Force initial out in gliders. Pre-military training rkkuşu Association, an organisation function to our own A.T.C.

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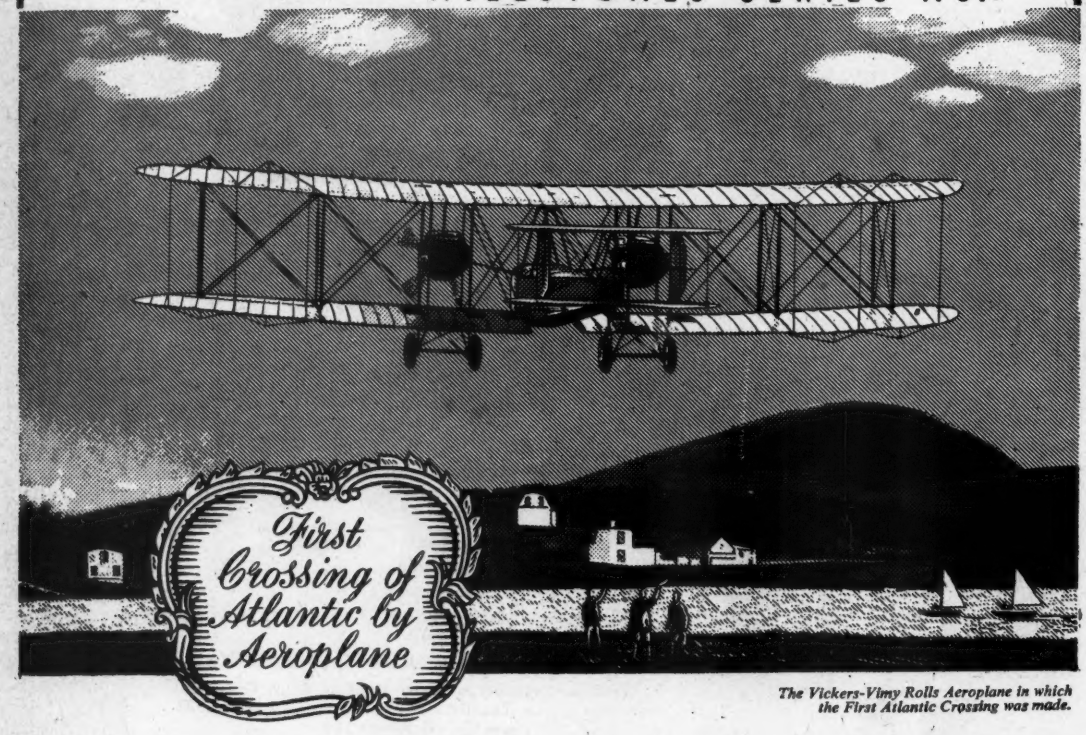

The Vickers-Vimy Rolls Aeroplane in which the First Atlantic Crossing was made.

When the smoke of battle clears we shall appraise fully the value of the Transatlantic Air Ferry Service. Yet it was not until after the Great War of 1914-18 had been won that the Atlantic was first crossed in a direct non-stop west to east flight by Capt. Alcock and Lt. Whitten-Brown, two Englishmen, both afterwards knighted for their achievement. They had in 1919 no complete meteorological data, no radio beam, but thanks to the Smiths of England, they were equipped with the finest instruments then available and were enabled to leave Newfoundland on June 14th of that year and arrive next morning in Ireland. Not only "Smith" aviation Instruments, but K.L.G. Plugs also contributed materially to the success of this brilliant and historic venture.

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It Must Not Happen Again

Control Problems of German Aviation : Secret Preparations After Last Defeat : Lessons from the Past

By V. L. GRUBERG

SIGNPOST TO FUTURE : A chained Mercedes engine placed on the Hamburg airport to symbolise the "cruel treatment" meted out to Germany's aviation after her 1918 defeat.

ON the Fuhlsbüttel airfield near Hamburg there stands (or stood) a significant little memorial: a broken Daimler-Mercedes aircraft engine chained to a stone and mounted on a pedestal. Briefly and pungently the inscription said "Versailles 1919." This was not a memorial to the fallen flyers of Germany. It was meant to be a reminder of the make-believe "stab-in-the-back" sustained by German military aviation, a challenge to the passer-by to cast the chains off—a signpost to Germany's future.

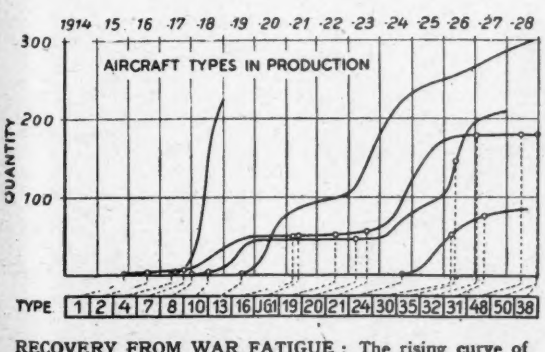
No such reminder was in fact ever necessary. For as soon as World War No. 1 was over, the Germans were at it again. While in other countries stormy battles were fought for every penny spent on military aviation, no effort was spared in Germany to revive military aviation in preparation for *Der Tag*.

Although these German preparations are no longer a secret (a substantial literature exists to testify to these efforts), even serious studies of the German problem often credit the Nazi party with the exclusive responsibility for the reconstruction of Germany's air power. Partially this must be attributed to Nazi official propaganda designed to secure for the party a particle of that aureole of militarism which is so much appreciated by the German rank and file. Yet this story, which was produced in Goebbels' laboratory, is wide of the mark of reality.

The drive to rearm Germany in the air had started years before the Nazis came to power. Although it gathered momentum and scope with their advance to power, culminating in the official appearance of the *Luftwaffe*, the foundations of the military edifice were laid in the pre-Nazi period. Without these foundations the arrival of the Nazi-built superstructure would have been, to say the least, considerably delayed.

So far as the responsibility for air rearmament is concerned, it reduces the Nazis and the pre-Nazi *Reichswehr* leaders, the politicians, the captains of industry and the scientists to a common, very common, denominator. This historical fact is well worth remembering, for it may enable us to view the post-war problem in the right perspective and help to prevent a repetition of mistakes made after the last war.

The problem of the regulatory control of German aviation, which is but a part of the larger issue of "what to do with Germany," must therefore necessarily be attempted in the light of past experience. This experience is still relatively fresh and, thanks to the repetition of German aggression within the span of one generation, there is no need to rummage in historical records for facts.



RECOVERY FROM WAR FATIGUE : The rising curve of different types of Junkers production.

Air Clauses

The chained Mercedes commemorates the following stipulations of the Versailles Treaty:

Art. 198. The Armed Forces of Germany must not include any military or naval air force.

Germany may during a period not extending beyond a definite date maintain a maximum number of 100 seaplanes or flying boats which shall be exclusively employed in searching for submarines mines, shall be furnished with the necessary equipment for this purpose, and shall in no case carry arms, munitions or bombs of any nature whatever.

In addition to the engines installed in the seaplanes or flying boats above mentioned, one spare engine may be provided for each of these craft.

No dirigible shall be kept.

Art. 199 Within two months from the coming into force of the present treaty, the personnel of the air forces on the rolls of the German land and sea forces shall be demobilised up to October 1st, 1919; however, Germany may keep and maintain a total number of 1,000 men, including officers, for the whole of the cadres and personnel, flying and non-flying, of all formations and establishments.

Art. 200 Until the complete evacuation of German territory by the Allied and Associated troops, the aircraft of the Allied and Associated Powers shall enjoy in Germany freedom of passage through the air, freedom of transport and of landing.

Art. 201. During the six months following the coming into force of the present treaty, the manufacture and importation of aircraft, parts of aircraft, engines for aircraft and parts of engines for aircraft shall be forbidden in all German territory.

Art. 202. On the coming into force of the present treaty, all military and naval aeronautical material, except the machines mentioned in 2nd and 3rd pars. of Art. 198, must be delivered to the Governments of the Principal Allied and Associated Powers.

Delivery must be effected to such places as the Allied Governments may select, and must be completed within three months.

Art. 314. Provided that Allied aircraft in transit over Germany should be subject to regulations "which shall be applicable equally to the aircraft of Germany and to those of the Allied and Associated countries."

Almost as soon as the armistice was concluded there was a general conspiracy to avoid and counteract the provisions of the armistice regulations. Although the initiative came from the Reich Ministry of Transport and the *Reichswehr*, practically everyone concerned in aviation took part.

"Managers, designers, workers made common cause in deceiving the Inter-Allied Control Commission. Models that should not have been built were built and hidden in woods, on meadows, in stables—till the Control Commissions had left. Everybody concerned felt that this was only right. The Commissions—why, they were the enemy." ("The Luftwaffe"—by Hauptmann Hermann.)

On January 10th, 1920, the treaty came into force. Although thousands of aircraft were being destroyed or surrendered, there was a constant effort to evade Allied control regulations.

IT MUST NOT HAPPEN AGAIN

In the words of Air Commodore Masterman, whose report supplemented that of Marshal Foch, the Germans since the beginning of December, 1919, had displayed "systematic indications of opposing and resisting the claims of the Allies, and have shown a firm determination, by continually employing tactics that will involve delay to fulfil the Peace Treaty." (*Flight*, January 20th, 1921.)

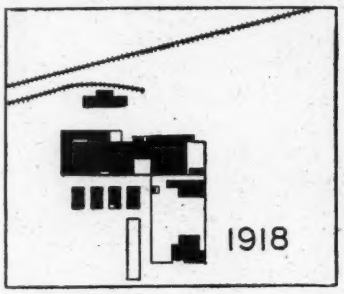
For this and similar reasons the Conference at Boulogne on June 22nd, 1920, decided that Germany could not begin to build any aeronautical material at all till three months after the day all material to be delivered or destroyed had been delivered or destroyed. Not that this helped much. Infringements of the stipulations laid down by the Boulogne conference included the production of aircraft by Junkers, Fokker and others, the development of a new type of seaplane, etc., etc.

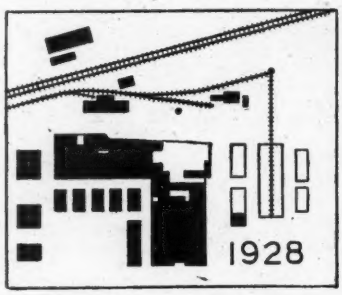
Here are a number of typical evasion cases picked up at random from contemporary issues of *Flight*:—

"Another 'find' of German aerial material has been made and confiscated by the Fleet in Stettin; this was concealed in the grounds of Major von Fuchs and consisted of secret army stores . . . in large cases, 1,907 which contained aircraft motors." (January 6th, 1921.)

"Aviation stores to the value of a million marks were discovered on December 15th in a wood near Bad Salzoflen, . . . including eight large crates containing aeroplane motors, propellers, parts, etc. . . . The Allied Control Commission . . . has discovered important stocks of aerial material, including 7,930 aeroplane motors and 281 aeroplanes and hydroplanes. The German Government itself, according to the Marshal (Foch), has recognised the existence of hidden material, and declares that it is ready to vote a new law rendering its declarations obligatory." (January 20th, 1921.)

These and similar efforts of evasion were well organised. And while some were the work of individuals or groups, the German government privately encouraged them, officially tolerated them, secretly largely sponsored and organised them, and publicly disclaimed them.





EXPANSION AFTER DEFEAT: Built-up area (in solid black) of the Junkers plant in 1918: 109 sq. m. In 1928: 244 sq. m.

Within three years further restrictions had to be imposed to curb Germany's evasive actions. The Conference of Ambassadors (April 14th, 1922) set up Nine Rules imposing limitations in size and performance on German civil aircraft with the object of keeping them within the strict non-military class. Under the definition of civil types, maximum speed was limited to 105 m.p.h., ceiling to 13,000ft., useful load to 1,300 lb., etc.

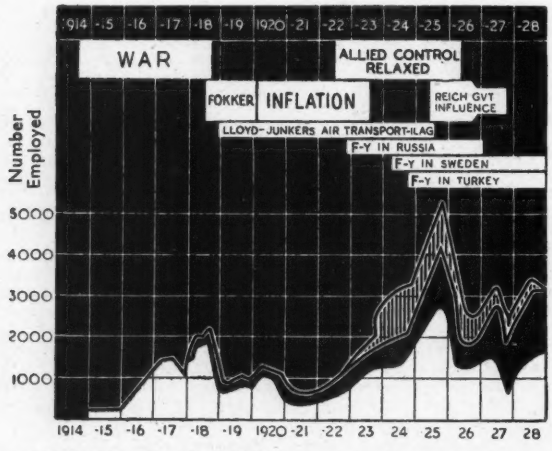
The Nine Rules misfired completely. First, German aircraft manufacturers migrated to Italy, Switzerland, Sweden, Russia and Turkey; Danzig, being a Free State, could be used without any restriction. "Foreign enterprises," admits a Dornier Company prospectus, "enabled the construction and development of types prohibited to be built in Germany." Among them the Dornier Company alone operated the *Costruzioni Meccaniche Aeronautiche S.A.* in Marina di Pisa, Italy; the Kawasaki works at Kobe, Japan; the *Construcciones Aeronauticas S.A.* in Madrid and Cadiz, and the Aviolanda in Papendrecht (Holland), and later also at Altenrhein, on the Swiss side of the Bodensee.

Already in 1921 the Dornier firm developed outside Germany the "Falke," a cantilever high-wing fighter, in 1927 a reconnaissance machine the Do-C; a torpedo seaplane the Do-D, a reconnaissance Do-E, and in 1925-6 the heavy bomber Do-N with two 500-500 h.p. BMW engines.

But this alone would not have sustained German aviation. There was a more basic reason. Throughout these years the victors displayed a lack of consistent and coordinated policy and far too much hesitation and willingness to negotiate. Consequently, the Germans were quick enough to exploit it and manœuvre themselves into a bargaining position. Indeed, the whole process of control of German aviation was marked by a peculiar rhythm:—two drastic steps forward—and a slide back.

Finally, the German Government, using for their authority Arts, 314, 198 (and 170), prohibited Allied aircraft in excess of the Nine Rules definitions to enter Germany and impounded those which had to force-land. The results were serious. The British route to Scandinavia and Russia could not be established, and the French Paris-Strasburg-Prague service had to be transferred from Southern Germany to a route across Switzerland. Germany was applying sanctions to her conquerors, and reversing the process of controls.

Not only was this game tolerated but it led again to a new modification of controls. On May 22nd, 1926, the Paris agreement virtually ended the Allied supervision of German aviation. A small number of army, navy and police officers were even allowed to take up flying instruction "as private individuals" paying for themselves; subsidies fostering aviation were strictly tabu. . . .



CONTROLS AND EVASIONS: Graph shows the labour force in Germany's aeronautical industry. (F-y=factory; white=airframe and solid black=engine production; cross-hatched=sub-contractors.

Finances

Eight years later, on November 28th, 1934, Mr. Churchill said in the House of Commons that "Germany already at this moment has a military air force—that is to say, military squadrons, with the necessary ground services, with the necessary reserves of trained personnel and material—which only await an order to assemble in full open combination—and this illegal air force is rapidly approaching equality with our own."

The financing system developed was rather subtle. As shown on the graph, for years before the official appearance of the *Luftwaffe* Germany, through the Reich Ministry of Transport, had been spending increasing sums ostensibly on civil aviation. Although in 1921 the total amount of subsidies for air transport was supposed not to exceed 11 million marks (about £540,000), actual figures were much higher. By 1930, total direct subsidies paid by the German Government for air transport were almost six times the amount paid by the British Government, and expenditure other than direct subsidies about three times as great.

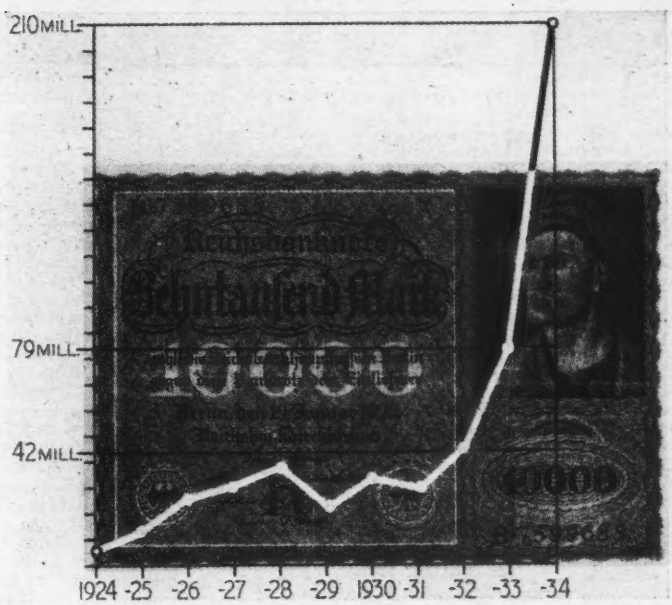
Research institutions such as Adlershof, Göttingen and Lindenburg were being generously fed with grants, not only by the central government but also by various regional authorities outside the Reich budget, such as the Prussian Ministry for Culture and Education, etc.

But this was not all; German local authorities, corporations, etc., not only spent vast sums on ground facilities but developed the habit of subsidising air transport, without such figures being too apparent in published statistics. In fact, it has been stated in a German study (Schenk H. Finanzierung u. Organisation d. Luftverkehrs, 1930) that sometimes these sums approximately equalled the subsidies of the central government!

Prior to the establishment of an Air Ministry by the Nazis, the Reich Transport Ministry was responsible officially for civil aviation while unofficially being also the channel through which the High Command secretly operated their programme to rebuild Germany's air power.

The veiled language of German expenditure reports is sometimes outright naïve: in 1924, for instance, in addition to all specified items, it is stated that about 25 million RM. were spent for "unspecified technical purposes" by the Reich Transport Ministry. In addition to this mysterious expenditure, other sums, officially earmarked for gliding and "air sport support," were spent on building-up military air cadres. While in the U.K. grants to light aircraft clubs in the years 1928-9 and 1930-31 amounted to a total of £52,000, Germany was spending more in official expenditure alone.

Nor was industry neglected. The tormented, economically struggling Germany spent 13 million RM. between 1929 and 1931 in direct support of the aircraft industry via the famous Reich Ministry for Transport. Not that this industry was particularly badly off. Riding on the lethargic attitude of her former enemies and victors, exploiting political windfalls and by "peaceful penetration" into international air transport, Germany had in fact secured a dominant position for the products of her aircraft industry. Within seven years of her defeat, within two years of the time when she was officially allowed to indulge in aircraft production, German-built aircraft operated on a route network twice the length of the French, four times the British, and more than the combined Anglo-French route mileage. Only German aircraft were used in seven countries, and by 1927-80 per cent. of the Italian, 80 per cent. of Finnish, 91 per cent. of Swedish, 72 per cent. of Polish and 25 per cent. of Swiss routes were operated with German aircraft.

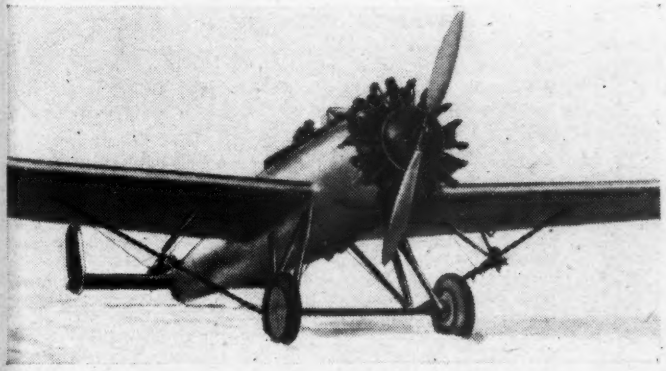


THE RISING CURVE: German expenditure on aviation (in Rm.). Officially admitted expenditure is shown, actual figures were considerably higher

Future Outlook

So much for the past. Any post-war settlement of the German air problem must, of course, be considered in the light of its own peculiarities, for under modern conditions both the aircraft industry and air transport are latent bearers of a major share of a nation's war potential.

For these reasons, Germany's air resources must be atomised, and any aviation activity which might continue on her territory must be reduced to a skeleton framework devoid of loopholes, and yet commensurate with the essential economic needs of Central Europe. For let no one believe that if the Germans are allowed even a marginal freedom to indulge in aviation pursuits, the eyes of the air police or other controllers would be vigilant enough to prevent them from using such facilities for military preparations.



BEGINNING OF THE HARVEST: A Junker K47 experimental Stuka built in 1928.

Just how effective controls are we have no more need to learn. Even if the physical occupation of Germany were to continue for many years, any freedom of action leaving opportunities for evasion would constitute a threat to international peace.

It would be equally dangerous to rely upon the disillusions of the German people with warlike endeavour after their experience in this war. The Germans have furnished ample evidence of their remarkable faculty for recovering rapidly from war fatigue. Even if one were to assume that the mass of the German people would be too passive, there is nevertheless likely to be a group of people or individuals bent upon the revival of Germany's air power. And there is no reason to believe that they would not find eager followers in Germany and, in time, ready friends and supporters elsewhere.

In the following brief suggestions I shall attempt to bring into a work synthesis the conflicting and seemingly irreconcilable demands of economic development and international security. Without trying to simplify the issue, it would be necessary to evolve a system of measures, some being purely negative—prohibitive—and others embodying elements of constructive policy. Without the latter the former would run the risk of soon being outlived by developments of events and economic needs, while vague and elastic formulation of rules in itself might open too many loopholes.

The system evolved should first consider how to render Germany's aviation *hors de combat* and ensure that it remains so, while simultaneously establishing a fixed framework setting the limits within which any aviation activity on German soil might go on. Under the first category of measures, enforcing complete prohibition, should come the industry, training and private flying.

Measures for Safety

It is assumed in advance that all stocks of finished and semi-finished aircraft, engines and accessories would be requisitioned by the United Nations. Such aircraft might go to help some European nations to tide over the initial period of their revival when, because of large-scale damage and inadequacy of surface communications, there is likely to be an urgent need of air transport.

(1) *Industry*.—The manufacture of any aeronautical equipment in Germany should be prohibited. Whatever may be left of the equipment of this industry should be requisitioned by the United Nations for the rehabilitation of German-occupied countries, in part-payment for the industrial spoils of Europe, and for the wholesale re-

IT MUST NOT HAPPEN AGAIN

moval by the Nazis of tooling and machinery plant from occupied countries.

(2) *No training* on powered aircraft of any size, no gliders and no parachute-jumping should be permitted. To impose rigidly this regulation is absolutely essential since, if permitted, in no time would these activities be used—as they were in the past—to build up cadres for the air force. The D.L.S.V. (Deutscher Luftsportverband—German Air Sport League), which started as a civilian organisation, soon became an organised cadre reservoir for the *Luftwaffe*, totalling by 1935 over half a million members organised in 2,500 branches. Germany was allowed to glide after the last war—and look where she had glided to by 1939!

(3) All private-flying activity, the private ownership of aircraft or any other airborne equipment should be prohibited. Even dispersed ownership would sooner or later lead to their use for pre-military training. "To allow Germany any private aircraft in the period immediately after the war would almost surely lead to the formation of flying clubs in which each individual aircraft would be kept in continuous and intensive service in order to give practice for the largest possible number of pilots. A large section of the pilots remaining to the *Luftwaffe* at the end of hostilities would thereby 'keep their hands in,'" says E. P. Warner (Future Controls over German Aviation, Foreign Affairs).

Control of Research

Research facilities and air transport problems would require a more positive plan. Here a brief reminder might be necessary for the benefit of those who view as distasteful any encroachment upon the freedom of "pure" research and might consider it as an attempt to strangle Germany's intellectual outlets. After the last war there was, apart from Göttingen, no sizeable research institutions left in the Reich; but no time was wasted in starting again under military patronage. *Luftwissen*, the official publication of the German Air Ministry (1943, Vol. 10, No. 5, p. 154-5), thus described these efforts:—

"The personnel of the D.V.L. scattered in all directions, and only small supporting units (*Stützpunkte*) remained, cautiously supported by the Inspectorate of Armed Forces and after its dissolution on May 8th 1920, by 'special quarters' within the Reich Defence Ministry. One of these small 'bases' of aviation was the remnant of the D.V.L. at Adlershof.

"From its very inception in 1920 the gliding movement, the entire technical work on the Wasserkuppe and later on at another place, were co-ordinated in special commissions co-operating with the D.V.L.

"The framework of activity of the D.V.L.—sponsored in 1923 by the Armed Forces Office (*Truppenamt*) of the Army Weapons Office (*Heereswaffenamt*) and later transferred to the Reich Ministry of Transport—had been substantially enlarged by 1927, and since that year a special allocation was secured for it in the Government Budget."

Research institutions and their equipment might be dealt with as under (1), except those which are either immovable or which the Allies might consider it practicable to retain in Germany.

The formation of an International Holding Corporation might therefore be practicable with the Occupation Powers and such members of the United Nations as are Germany's geographical neighbours as shareholders. Endowed with permanent and exclusive concession rights for the possession and exploitation of specified institutions, airfields and installations, this Corporation would be responsible for: (1) research institutions; (2) the maintenance of ground facilities including meteorological stations, etc.; (3) for international trunk routes which the control commission might decide to operate in the interest of European economy.

A small share in the administration and operation of the Corporation might be allotted to carefully selected and "vetted" German nationals. But to safeguard the continuity of the Corporation's work and its control, the controlling interest should be permanently vested in a non-German majority, while provisions might be made for the German share to increase gradually on an escalator scale. Such increases should not come into operation automatically, but by a majority vote of shareholding States taken at regular intervals of, say, four years, the maximum ceiling of German participation being so fixed as never to exceed the participation share of any one of the major Allied powers.

The Corporation would closely co-operate with the Allied Control Commission and act through representatives in each of the occupational zones, thus not disturbing the regional set-up of the occupation. The existence of a purely practical joint organisation would ensure a uniformity which, if important in other spheres, is essential in aviation.

But the advantages accruing from setting up such a Corporation owned by several nations, internationally staffed and controlled, extend beyond the immediate control tasks. It would this time give selected German scientists and technicians an opportunity of contributing towards human progress and of rehabilitating the name of German science which has contributed so much evil for the world.

It might equally serve as a unique test ground and valuable experiment for practical regional co-operation in civil aviation and as a nucleus for some wider organisation in the future.

R.A.F. PIGEONS TO BE "DEMOBBED"

WITH the consent of the National Pigeon Service Committee, *Per Ardua*, the R.A.F. pigeon which cut the British 1,000-mile record in half, is to be offered for sale at the Allied Forces Mascot Club Fête at Chelsea Hospital Grounds, Chelsea, London, on Saturday, September 8th, in aid of the R.A.F. Benevolent Fund and the Allied Forces Animal War Memorial Fund.

Other distinguished war pigeons bred by the R.A.F., including *Ruhr Express*, a Dickin Medal winner, and the parents of *Per Ardua* may also be auctioned at the same time in the same cause. *Per Ardua's* record flight was from Gibraltar to Gillingham, Kent, 1,090 miles, which she covered within 12 days.

AWARDS WON BY R.N.Z.A.F.

SINCE the outbreak of the war, 1,345 honours and awards have been won by members of the Royal New Zealand Air Force. That figure is correct to June 16th. It excludes mentions in despatches, which total 245, comprising 164 in the European zone and 81 in the Pacific.

New Zealand airmen in the Pacific won 30 Distinguished Flying Crosses, and the total of 75 awards was gained in that area, including 19 American decorations. The D.S.O. was gained by 67 airmen, four of whom received Bars.

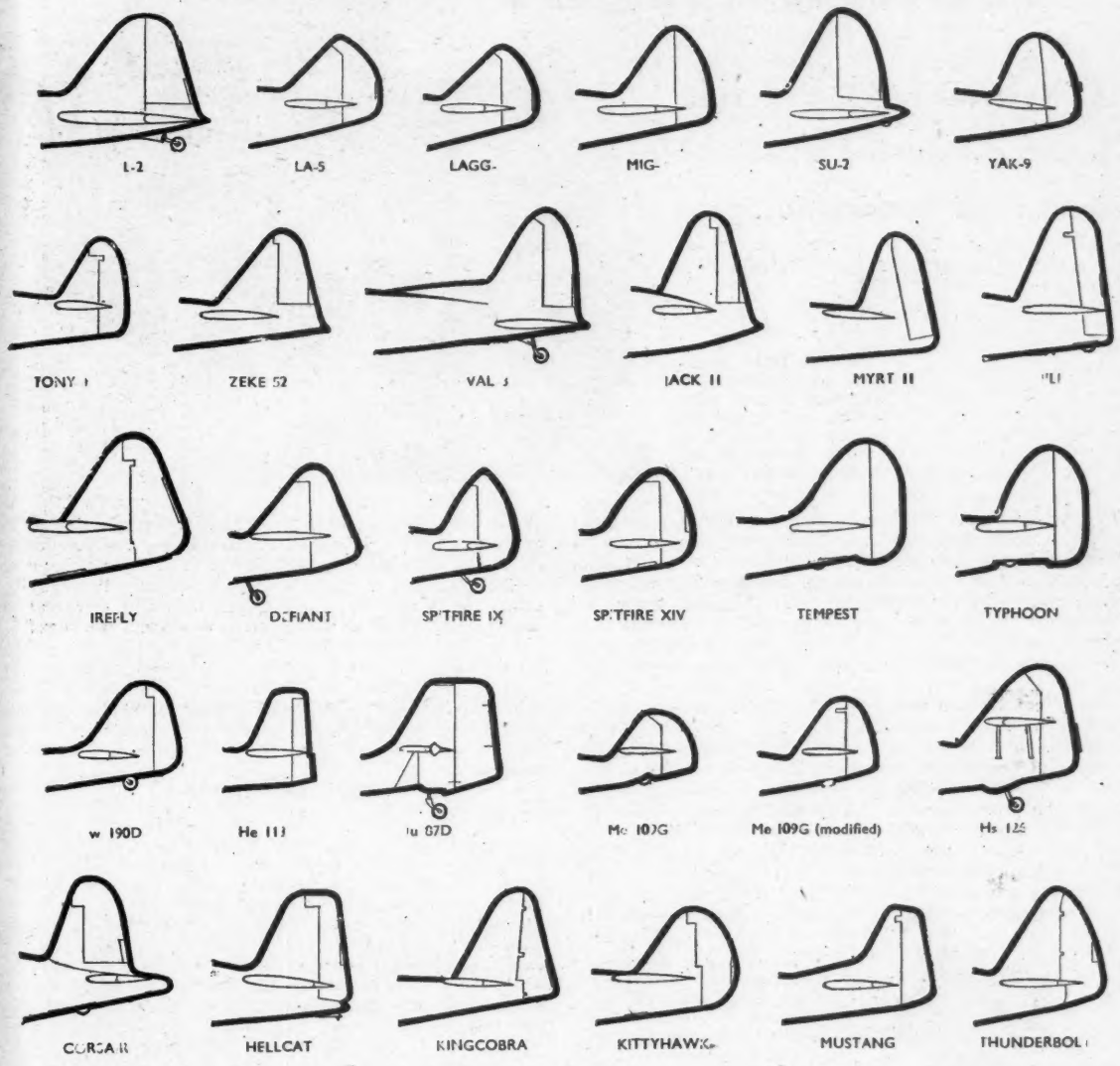
In Europe and the Middle East, 770 airmen won the Distinguished Flying Cross, 70 received Bars to it, and four gained the signal honour of winning two Bars. The Distinguished Flying Medal was won by 168 airmen in the European zone and seven in the Pacific. Only one Bar was received to this decoration.

The Air Force Cross was won by 67 members of the R.N.Z.A.F. and two Bars to it were also won. The Air Force Medal was awarded five times.

Two members of the R.N.Z.A.F. have won the Victoria Cross. Other decorations include four George Medals and five Conspicuous Gallantry Medals.

Belligerent Tails

Designers' Signatures in Fins and Rudders



THE old saying about the tail wagging the dog is literally true in aircraft—at least until buffeting sets in; then the dog wags the tail, sometimes to some tune. That our knowledge of aerodynamics is still far from being an exact science seems to be proved by the variety of shapes found in fin-and-rudder combinations.

The sketches above have all been drawn to a uniform scale, and the tails depicted are all of single-engined fighters or fighter-bombers, and all monoplanes. Some sort of uniformity might, therefore, have been expected. The diagrams show that sizes and shapes vary with individual designers, or at least with individual firms.

If one tries to analyse the shapes, little logic is apparent. Not even in the different nationalities can one trace any definite "trend." This is rather surprising, since it might have been expected that designers of any particular country would base their calculations, and therefore sizes and shapes, on the model results of that nation's laboratories.

The one tendency observable is towards increasing the chord of the rudder towards the lower end. This is probably due to structural rather than aerodynamic considerations, the rudder being hinged to a vertical cantilever fin, the side loads on which may be expected to be reduced by having the centre of pressure of the rudder as low as possible.

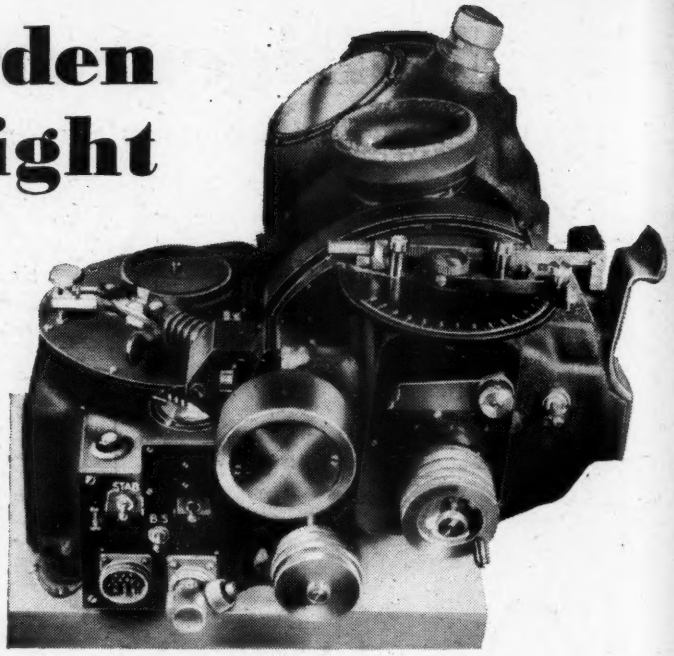
For the rest, rounded and straight trailing-edges seem to be about equally popular, but aspect ratios vary a good deal.

Fin and rudder areas show great variations. The reason for this might have been more understandable had the fuselage length been included in the diagrams, since then tail "volumes" could have been assessed.

One thing worth noting is that in none of the British or German types shown does the fuselage project beyond the rudder, whereas in some of the American and Japanese types it forms a neat tail fairing unspoiled by the rudder.

The Norden Bomb Sight

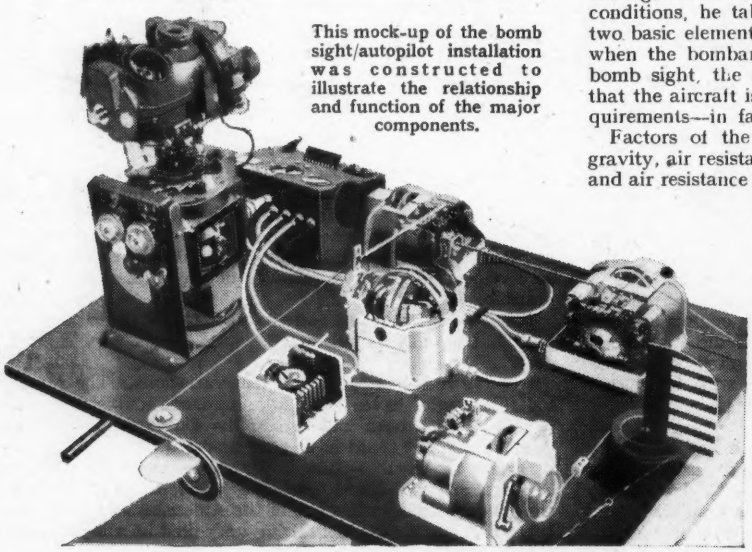
A System of Instruction Between Autopilot and Bomb Sight : An Automatic Speed and Distance Calculator



The semicircular graduated scale beneath the telescope eyepiece is for setting trail lag, and the largest of the three central knobs is for setting falling speed.

THE famous Norden bomb sight, which gained an almost legendary reputation in the earlier part of the war, was actually invented by Carl L. Norden as early as 1928. Operation of the instrument is linked inextricably with the automatic pilot (officially known as Stabilised Bomb Approach Equipment) which was also developed by Norden, in 1935, so that full advantage could be taken of his bomb sight. This equipment is the standard automatic pilot fitted to American aircraft and, in this system, the Norden bomb sight is installed directly on the housing of the azimuth stabilising unit. In common with all forms of automatic pilot, S.B.A.E. embodies three basic groups of equipment comprising gyros, servo motors and follow-up systems to render the degree of control surface deflection proportional to the deviation of the aircraft.

In the autopilot/bomb sight combination, the azimuth stabilising unit (also called the directional stabiliser) can control both the aircraft and the bomb sight in azimuth simultaneously or separately. When the S.B.A.E. and sight are used together the bomb sight knobs are rotated to point the sight at the target, which action also turns the aircraft in the requisite direction to ensure a collision course at any ratio the bombardier desires. The flight gyros control the aircraft laterally and longitudinally through the follow-up system by operating ailerons and elevators as required. A banking motor introduces bank into turns by moving the aileron sector in the flight gyro by an amount proportional to rudder movement, thereby actuating the appropriate servo motor to displace the ailerons. The follow-up system governs the amount of control surface deflection applied for any aircraft deviation, and returns the control surface to neutral after the correction has been made.



This mock-up of the bomb sight/autopilot installation was constructed to illustrate the relationship and function of the major components.

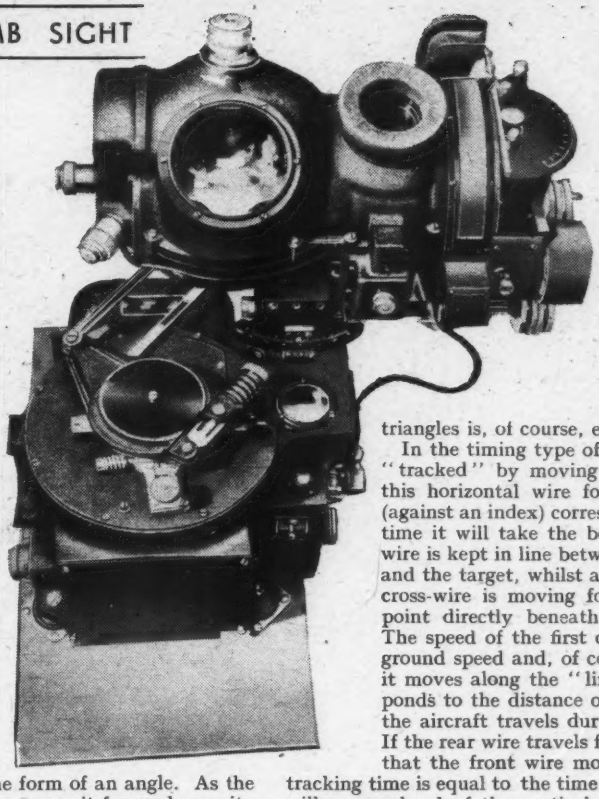
Bombing Problem

Thus, without going into details of the composite mechanism, the autopilot is a means whereby the aircraft can be controlled in its flight attitude, and the bomb sight is a governing agent of the automatic pilot. The bombardier looks through his sighting telescope and, having pre-set on the sight the various evaluations of the proposed bombing conditions, he takes over control of the aircraft. As the two basic elements of the composite system are correlated, when the bombardier turns the appropriate knobs on his bomb sight, the autopilot half of the installation ensures that the aircraft is flown according to the bombardier's requirements—in fact, he flies the machine.

Factors of the bombing problem are: aircraft speed, gravity, air resistance, windage and target motion. Gravity and air resistance factors are obtained from a pre-calculated table from which the bombardier gets his first setting. Since initial velocity of the bomb is that of the aircraft, and this velocity is decreased by air resistance so that the bomb trajectory is a segment of a parabolic curve, these data can also be pre-calculated and supplied to the bombardier in order that he can set the sight to compensate for trail.

Windage implies correction for drift which, unfortunately, is complex as the bomb does not fall on the ground track of the aircraft but swerves aside. The sight does not require a special setting for this as the correction is automatically made by a mechanical

THE NORDEN BOMB SIGHT



Aft view of sight. Left of the eyepiece is the gyroscope window in which bubble levels indicate precession corrected by the knob above. The scale below and left of the window is for pre-setting drift.

linkage between the trail mechanism and direction control.

Target motion has a similar effect to that of wind of the same velocity in the opposite direction. In actual practice it makes no difference whether the wind or the target is in motion, nor does a combination of wind and target motion require additional setting. After settings for trail lag and falling time are made, the only critical factors are those of resultant "closing" speed and direction of the aircraft relative to the target. These elements are irrespective of the fact that the aircraft itself is capable of both linear and angular movement in three dimensions. However, this difficulty is taken care of by the electrically driven gyros which govern the stabilised line of sight.

The essential criterion of bombing is, naturally, the determination of the correct point at which to release the bombs, and the Norden bomb sight is basically an automatic speed-and-distance calculator which resolves the critical factors in the form of an angle. As the bomb is released, its momentum moves it forward, gravity pulls it down, and air resistance retards both actions. The first calculation is the length of time required for the bomb to reach the target; then the sight determines the horizontal speed relative to the target and multiplies that speed by the time of fall. The quotient is the horizontal distance, without retardation, which the bomb would travel during the time of fall. After subtracting the trail lag from that distance, the bomb sight produces a range angle which is formed by the intersection between the bombardier's line of sight to the target and a vertical line from the aircraft to the ground at the exact instant of release.

This evokes a right-angle triangle formed by the vertical line from the aircraft to the ground, the ground line from that point to the target, with the hypotenuse formed by the line of sight from the bomb sight to target. In the bomb sight itself there is a tiny replica of this triangle which is created by the same vertical line beneath the aircraft and the same hypotenuse line of sight, but is bounded on the bottom by a horizontal wire. The ratio of the sides of these two triangles is, of course, equal.

In the timing type of bomb sight the target is "tracked" by moving a cross-wire back along this horizontal wire for a number of seconds (against an index) corresponding to the estimated time it will take the bomb to fall. This cross-wire is kept in line between the bombardier's eye and the target, whilst at the same time a second cross-wire is moving forward from the vertical point directly beneath the bombardier's eye. The speed of the first cross-wire corresponds to ground speed and, of course, the distance which it moves along the "line of sight" wire corresponds to the distance on the ground over which the aircraft travels during the time of tracking. If the rear wire travels forward at the same speed that the front wire moves rearward, and if the tracking time is equal to the time of fall, then the rear wire will move ahead of the vertical a distance corresponding to the actual distance which the aircraft will travel during the falling time of the bomb.

However, this will not give the correct range until trail has been subtracted. The rearmost wire is initially set to the rear of the vertical by an amount corresponding to the trail distance. It thus starts forward with a handicap so that it will travel beyond the vertical for a distance corresponding to the correct range. With all these settings made, the bombardier's line of sight through the rear cross-wire is the line of sight, which should pass through the target at the instant of release. By virtue of the autopilot synchronisation, the bombardier directs the aircraft on the run-up to the target and, when the rear cross-wire comes in line, the bombs are automatically and instantaneously dropped. The line of sight is actually the axis of the sighting telescope, which is swung by a variable-speed drive so that the telescope automatically keeps on the target. The drive mechanism sets up within itself a release line of sight angle corresponding to that comprised by the rear cross-wire as previously described. The lateral cross-wire is kept on the target as the telescope is driven, and, when the telescope reaches the correct angle, an electrical contact is made which actuates the bomb releases.

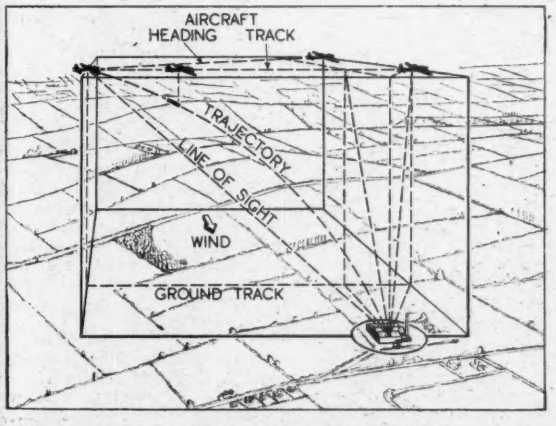


Diagram of relation between aircraft and target throughout bombing operation, indicating linear and angular drift values.

SEAFIRE XV OFF THE SECRET LIST

SOME details of the Supermarine Seafire XV, which is the fastest naval interceptor fighter built in Britain, were released last week-end by the Admiralty.

Fitted with a 1,890 h.p. Merlin engine, it has a top speed in the neighbourhood of 400 m.p.h., a ceiling of more than 35,000ft., and a faster rate of climb than any other British built naval fighter.

Armament consists of two 20 mm. cannon and four 0.303in. machine guns, and one 500 lb. bomb can also be carried. Provision is also made for the use of rocket-assisted take-off when operational circumstances demand it.

Flying weight of the Supermarine Seafire XV with full radio and other equipment, including deck-arrester hook, is round about 8,000 lb. Dimensions are: Span 36ft. 10in.; length 31ft. 10in.; wing area, 242 sq. ft.

CIVIL AVIATION

C.E.R.C.A.

Commonwealth and Empire Conference on Radio for Civil Aviation

The Rt. Hon. Lord Winster, Minister of Civil Aviation, speaking at the opening of the Conference.

THE meeting of the Commonwealth and Empire Conference on Radio for Civil Aviation which opened in London marks a further step in international co-ordination in civil aviation. Before the war international standardisation of radio aids and procedure existed mainly regionally and to some extent among countries participating in the I.C.A.N. But it had not been universal, partly, perhaps, because the necessity was at the time not as pressing as it will shortly be when long-distance air routes are established. A wide divergence in radio equipment and practice has thus grown up, especially between North America and Europe, accentuated by the fact that practical application did not follow the improvement of aids.

The needs of war were a strong incentive to reconsider the whole question of the international standardisation of radio aids, and in October, 1943, Sir Stafford Cripps, as chairman of the Radio Board of the War Cabinet, convened the first Commonwealth and Empire Conference on radio for civil aviation. This was to be the first step towards further international discussions. Out of this Conference, which first met in February, 1944, the C.E.R.C.A. organisation was born, representing civil air radio departments of the Governments of the British Commonwealth and Empire and aimed at formulating recommendations on all matters relating to the immediate and ultimate international standardisation of radio and radar devices for civil aviation. This does not only refer to equipment, but also to standardisations of rules and regulations relating to their use.

Policy

It is the policy of C.E.R.C.A. to have at all stages of its proceedings, as and when security considerations permit, informal discussions with the other Allied nations, to ensure that at the first appropriate international conference their tentative conclusions have a maximum probability of acceptance. It is believed that the final stage of general international agreement will be facilitated through this gradual process of formulation and adjustment of projects and thought among the principal nations concerned.

Even the completest agreement in conference, however, would leave the net product as nothing more than a list of technically sound proposals which each member Government might submit separately in international conferences; putting forward such proposals each Government will do so only because their technical soundness has been tested in free debate by the strongest collection of brains that could be brought together.

Two C.E.R.C.A. conferences have already been held—the first in London in February, 1944, and the second in Ottawa in November of that year. Recommendations have been agreed for the immediate but interim international standardisation of such radio aids as are now available to civil air transport. A first draft of recommendations for the allocation of radio frequencies to civil aviation use has also been prepared and is now being considered in conjunction with the plans of other countries and also with those for the non-aviation user.

No firm proposals have yet been formulated on which radio aids may be suitable for international standardisation as it was concluded that there is not yet available either from military or pre-war sources a group of tried radio aids justifying international standards. To complete its recommendations for international standardisation C.E.R.C.A. had drafted a programme of development to be undertaken within the Commonwealth and Empire of radio aids to be recommended when their suitability has been demonstrated. It will be attempted at present to obtain agreement on the operational requirements and a selection of the most promising radio aids.

To facilitate and promote a better exchange of information a permanent central office of the C.E.R.C.A. has been set up in London. It is often asked how these new bodies organised during the war fit with each other and to what extent do they overlap. The C.E.R.C.A. has already a two-year lead in P.I.C.A.O. (Permanent International Civil Aviation Organisation) in the study of radio systems for international standardisation. It is therefore believed that the proceedings of the Empire body would prove vital to any international organisation. The C.E.R.C.A. was also represented on the wireless and telegraphy sub-committee meetings of I.C.A.N. (International Commission for Air Navigation, previously known as C.I.N.A.). The integration of C.E.R.C.A. within the framework of Empire air transport co-operation is illustrated by the fact that its secretariat has been allied together with the permanent office of the Commonwealth Air Transport Council and by the recommendation of the Southern African Air Conference that future developments of radio communications on Southern African routes should follow as far as possible C.E.R.C.A.'s proposals.

To secure the universal agreement on application of radio for civil aviation will be the task of the international civil aviation organisations but, as Lord Swinton pointed out, the full exchange of experience and ideas which C.E.R.C.A. has had and the tentative conclusions it might reach will be of infinite value to the larger body.

At the third C.E.R.C.A. meeting which is now taking place in London all Commonwealth countries constituting the organisation are represented together with Colonial Office delegates and technical advisors. Both the United States and the Soviet Union have sent delegations to attend the Conference, a happy indication of the appreciation of its work. Because of the presence of Russian and American representatives it will be possible to exchange views on the most promising systems of radio communication which would be later recommended for use on international routes.

Agenda

The agenda of this Conference is packed with such important items as revision of radio aspects of the final act of the Chicago Conference, radio airworthiness requirements, standards for aircraft radio equipment, terminology, etc. As already mentioned the discussion will also cover standard radio systems for the immediate post-war period, proposals for international standard systems embracing the whole range of aids such as short and long distance aids to navigation, traffic controls and application of radio in rescue operations, in prevention and avoidance of air-to-air collision, etc.

The opening of the plenary session of the Conference was presided over by Lord Winster, the new Minister of Civil Aviation, who said that radio is one of the greatest means to make air travel synonymous with speed, safety and comfort, and war has given civil aviation a breathing space in which to think out its aims while war experience have been making those aims easier of accomplishment on the technical side. Lord Swinton,

C.E.R.C.A.

who was invited by the new Minister to attend the Conference, said that if civil aviation is to make the best and most practical use of science there must be an intimate and constant partnership between scientists and designers on the one hand and civil aviation administration and operators on the other. He recalled that the application of radar has revolutionised warfare and thought its application equally important to civil aims.

Speakers representing Canada, Australia, New Zealand, South Africa, India, Southern Rhodesia, and Newfoundland greeted the assembly and expressed their satisfaction with the work hitherto achieved. Air Commodore A. D. Nevill (New Zealand) thought it difficult to understand the need for any divergence between military and civil methods and equipment in the case of military transport aircraft and civil transport aircraft flying on our world-wide air routes, particularly in regard to communications, navigation aids and flying control.

So that the transition stage should be smoothly effected he suggested that military authorities themselves might give the most serious consideration to the possibility of rationalising their needs in the light of future civil air transport requirements. If aircraft now emerging from production lines are to be equipped the best radio equipment now available should be accepted and standardised for the next five or six years. Certain broad targets to our research and developments should be kept for the succeeding decade.

Sir Frederick Tymms (India) pointed out that some radio aid must be adapted for the small operator and for the private flyer at a cost and weight within their reach, and even in large aircraft weight means money. 200lb. of additional radio equipment in a transport aircraft means the sacrifice of something of the order of £4,000 a year in revenue. Sir Frederick thought that the adopted systems of ground equipment should have the widest possible range of utility for all classes of aircraft and all geographical and other conditions of navigation to avoid the multiplication of equipment on the ground. Large and relatively poor countries would otherwise be unable to afford a ground organisation required for international air navigation.

Mr. Charles P. Taft, head of the U.S. delegation, expressing their appreciation of being invited to participate as observers at a Commonwealth Conference, hoped that in the broad field of aviation the solution of Commonwealth-American relations will be as successful as it is certain to be in the communications field. In this wider field he cited as the only real problem the fifth freedom—short distance pick-ups on a long hop. "We are all agreed," Mr. Taft said, "that the long distance civil aviation that concerns both you and us cannot be profitable without these short distance pick-ups. We both want it to be profitable and we deprecate excessive subsidies, I believe. Now, with that measure of agreement and the spirit evidenced by the daily co-ordination between our technical experts and our official representatives, it seems a pity still to keep making stern faces at each other in public."

After the inaugural session the Conference split into commissions composed of experts in the different subjects under discussion.

CIVIL AVIATION NEWS

LIMITATION

NOT more than three members of any one family may travel in the same aircraft on the bi-weekly airline between Lisbon and Oporto, which begins on October 1st. Until more extended services are developed there will be a strict air-travel "rationing," giving priority to Government servants, invalids, journalists, and business men with urgent affairs.

FRENCH TEST FLIGHT

ONE of France's newest and biggest seaplanes has arrived at Dakar, in French West Africa, after covering in its first flight a distance of 2,790 miles from Biscarosse, on the Atlantic coast, at an average speed of 192 miles per hour.

The seaplane carried the French Air Minister, M. Charles Tillon, and M. Pierre Charles Cournarie, Governor-General of French West Africa.

It has six engines developing a total of 7,740 h.p., and is capable of carrying 40 passengers as well as mail over the North Atlantic by day and night. Its maximum speed is 250 miles per hour. It can remain in the air for 20 hours.

SWISS AGREEMENT—

THE conclusion of an air transport agreement between the United States and Switzerland was announced by the U.S. State Department.

The agreement provides reciprocal rights for American air services to Switzerland and for a Swiss airline to operate across the North Atlantic to New York.

—AND SERVICES

A DAILY air service between Geneva and Paris and between Zurich and Paris is to be resumed immediately and will be operated on the basis of a pool arrangement on equal terms by the French and Swiss airlines.

NEW AIRPORT

PHILADELPHIA'S new North-east airport was opened recently for commercial airline passenger, mail and express services. Six airlines will operate daily schedules connecting Philadelphia with New York, Boston, Washington, Miami, Los Angeles, San Francisco, Seattle and many other points.

DESTINATION: POTSDAM

KNOWN as "Operational Terminal," the R.A.F. airfield at Gatow, Berlin, handled the British and American delegations to the Big Three Conference at Potsdam.

During the three weeks of the operation some 1,800 aircraft —including 970 British and 760 American—were logged in and out of Gatow and carried over 2,000 passengers without a hitch.

American Skymasters and British Yorks were used to convey British and American Conference leaders, while their staffs were flown in Dakotas.

EXPORTS

AN enquiry for £3,000,000 worth of British aircraft and airfield equipment has been received in this country from Argentina.

GONE HOME

JERSEY AIRWAYS and their associated company Channel Islands Airways have re-established their head offices in the Channel Islands, Jersey Airport.

FIFTY-FIFTY

AN international airport is to be established half on French half on Swiss territory.

A French delegation is reported to have arrived in Berne to discuss details of the project.

LOWER RATES

THE BRITISH AVIATION INSURANCE COMPANY, LIMITED, have intimated that, with the gradual return of Civil air traffic, utilising all modern aids to navigation and control, a general reduction of passenger accident insurance may be expected.

IRISH RECORD

THE Irish Airline Company, Aer Lingus, carried during the week ended July 28th last 39 per cent. more passengers on the Dublin-Liverpool service than in the previous record week, and 12 per cent. more than in the pre-war peak month of August, 1938. The number of passengers carried during that week was 643.

PASSED

THE Australian Nationalisation of Airline Bill passed without one amendment through all stages in the Canberra House of Representatives.

The reason for the smooth passage was the Opposition's decision to transfer the real fight to the courts, where they expect the measure to be declared *ultra vires*.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

WHAT DOES THE PRIVATE OWNER WANT?

A Clean 3-4-seater for Less than £1,000

"INDICATOR" asks in *Flight* of July 12th what the private owner wants. I want a modern private aircraft of my own; it must be small, economic, clean, reliable, pleasant to fly, easy to maintain and, preferably, be a four-seater, although I would be content with a three-seater. Further, I want to be able to buy it for less than £1,000, and I insist on it being British.

Having set this down, I can now mull over the "musts" and adduce the sort of machine I should like. Initially, the size must be of the 30ft. to 35ft. span order which allows of convenient parking and hangarage, including manhandling. Economic operation is bound up with the engine, and as I prefer to put my trust in a Gipsy or Cirrus, that is more or less taken care of; however, linked with the economic operation of the engine is the imposition placed upon the engine efficiency by the aircraft design, which is resolved as to what you get in terms of aircraft performance for given engine operating conditions. We are thus led to the precept that the aircraft must be aerodynamically clean and that the whole drag side of the design should receive very careful attention.

Cleanliness is my next condition, and this I feel is quite important. I see no reason why one's personal aircraft should not be as cleanly as one's car, and there is every reason to insist that to go to the field, take out the machine, fly it for 150 miles and go to a meeting without the necessity of extensive ablution should be taken for granted.

Reliability is probably the Achilles heel of all aircraft; nevertheless, it would be pleasant to have an aircraft which needed no more attention to the airframe and bits and pieces than that required by its engine. Possibly this sort of reliability will one day eventuate—it will be a happy day.

On the score of being pleasant to fly, I am particularly insistent. If the seat, pedals and column are not adjustable, then I should probably want them modified to suit. In a light aircraft, control forces are usually negligible, and in many cases, unfortunately, so also is accuracy of response. Light, positive and accurate control is essential, likewise accurate trim control. Visibility must be first class, with as large a field of view in all directions—including upward and backward—as possible. Seats must be high backed and have the back nearly vertical—it reduces fatigue. Instruments must be clearly marked (if not of Service standard) and placed as nearly as possible directly facing the pilot's seat. As to what flying instruments should be provided, as distinct from the engine instruments, I should like an A.S.I., sensitive altimeter, turn and bank, and directional gyro. In addition to these a P.6 or P.4 compass is a necessity, and I should also like a really accurate clock with a secondary trip dial.

Ease of maintenance I have already touched upon, but a factor which has a most important bearing on this subject is the ease and cheapness with which spares can be obtained—not only from the maintenance angle, but also from considerations of insurance.

Whether or not the machine is of wood or metal I do not really care. In the case of such a machine as I have in mind, there is not much to choose between the two, for what you gain on the swings you forfeit on the roundabouts.

Finally, there is the question of accommodation. Three seats are essential; four are desirable. If a three-seater, the front seats should be side by side with a central rear seat; if a four-seater, the seats should be paired front and rear. Wide car-type doors hinged on their leading edges are also desirable, and if it is considered not worth while fitting doors on each side, then the door should be on the starboard side.

Accommodation for light luggage should also be provided, and in this case probably the rear seats could be made easily removable, and, say, four or six lashing points be incorporated whereby a couple of suitcases could be secured.

In general the type of private aircraft I should so much like to own would doubtless make a positive appeal to many people. It might also be a useful type for clubs to own for charter by members for week-ends. When one considers the potential market for such a machine as this, not only here, but in other countries, then one is a little bewildered by the seeming lack of incentive or market appreciation by the British manufacturers.

If I wanted, and the import tax permitted, there are American machines that would fulfil my requirements—after all, £1,000 is a fair amount of money—but, like many others, I have a fondness for the products of my own country. However, I would point out to the British aircraft industry—or that section of it interested in light, private aircraft—that although forbearing and wishing to buy British, I am not immune from foreign attraction in offering me what I want at a price I can afford, and if Britain cannot, or will not, trouble to make available that which I want to buy, then I shall have to buy foreign.

BARRIE HILERY.

CENTRIFUGAL FORCE

A Mathematical Query from "Seac"

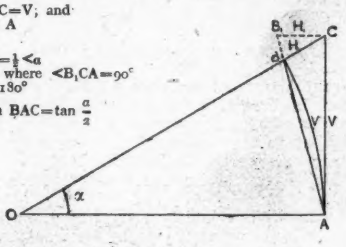
CAN anyone help me? I have worked out a perfectly valid formula for the calculation of centrifugal force in a turn, but am unable to prove that it is correct. In fact I am perfectly able to prove that it cannot possibly be right.

It started in an attempt to provide a formula which would substitute rate of turn $\left(=\frac{\text{angle}}{\text{time}}\right)$ for radius of turn in the conventional formula of $\frac{V^2}{r}$ commonly used. This, on given facts relating to a turning aircraft, would make the calculation easier, eliminating the need to calculate the radius of turn.

After a lot of woolly-headed working, it seemed that the centrifugal force (horizontal component) bore relationship to the speed in unit time as follows (see diagram): $\frac{H}{V}=\tan\frac{\alpha}{2}$

GIVEN: AB=AC=V; and AC tangential at A

PROVABLE:
(1) $\angle BAC=\frac{1}{2}\angle\alpha$
(2) H = H where $\angle B_1CA=90^\circ$
(3) OBC=180°
(4) $\frac{H}{V}=\tan BAC=\tan\frac{\alpha}{2}$



where
H = horizontal component (centrifugal force)
V = speed, i.e., distance in unit time
α = angular change of direction in degrees in unit time.

However, this is wrong and gives about half the required answer. By "inspiration," I tried using $\frac{H}{V}=\tan\alpha$ (the *whole* of α) and obtained results which were nearly right. I found that they varied from the correct answer by a definite constant for any given rate of turn (α).

Thus I got $H=\tan{}_\alpha VK_\alpha$.

K_α proved to be .9996 for $\alpha=2^\circ$; .9991 for $\alpha=3^\circ$; .9984 for $\alpha=4^\circ$; etc. (i.e., 1.0000 − .0004; 1.0000 − .0009; and 1.0000 − .0016, etc).

In other words, $K_\alpha=1-\frac{\alpha^2}{10{,}000}$

This formula, then, gave correct answers:
$H=\tan\alpha\ V\ K_\alpha$.

Where H = horizontal component (centrifugal force)

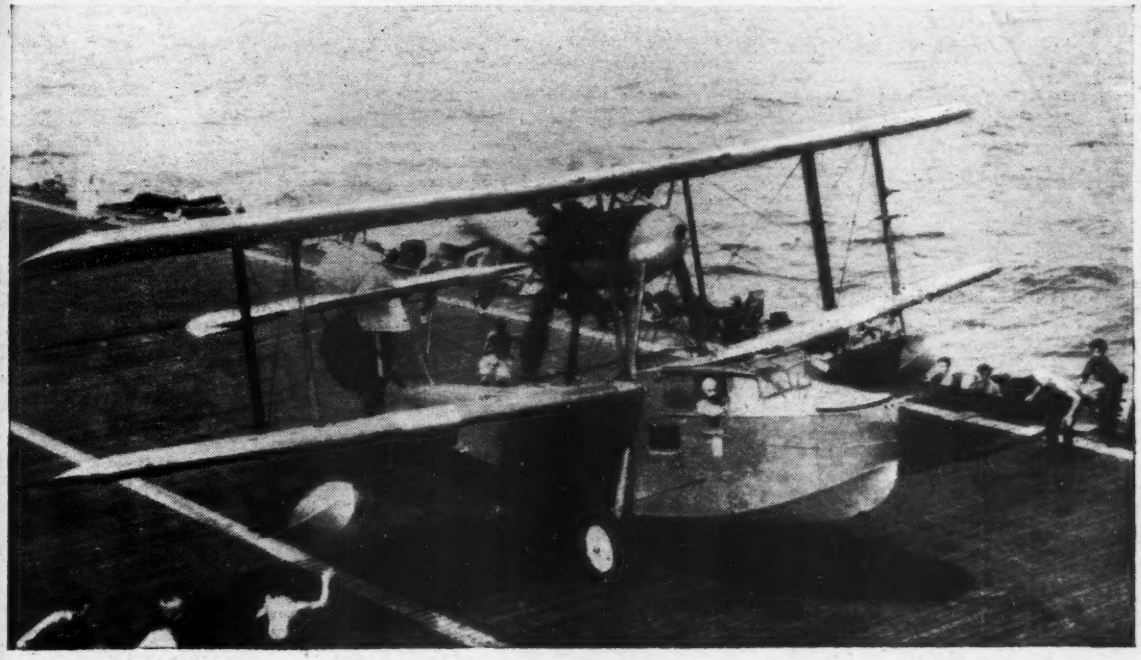
α = rate of turn, $\frac{\text{deg.}}{\text{unit time}}$

V = speed, $\frac{\text{distance}}{\text{unit time}}$

and $K=1-\frac{\alpha^2}{10{,}000}$

Can somebody help a tormented South-East Asian soul by proving that this is right. As I say, all I can do is to prove it wrong.

J. COHEN (Flt. Lt.).



AMPHIBIOUS OPERATION: Lt. (A) S. Lawrence, R.N.V.R. landing his Walrus on the deck of a carrier after picking up a Hellcat pilot who had been shot down into the sea during an attack on the Nicobar Islands.

SERVICE AVIATION

Royal Air Force and Naval Air Arm News and Announcements

Appointments

Naval Air Staff

Capt. CHARLES E. LAMBE, C.B., C.V.O., R.N., has been selected to succeed Acting Rear-Admiral L. D. MacIntosh, D.S.O., D.S.C., as Assistant Chief of the Naval Staff (Air) in August, 1945, and is granted the acting rank of Rear-Admiral whilst holding the appointment.

Acting Rear-Admiral MACINTOSH will succeed Rear-Admiral A. R. M. Bridge, C.B.E., as Flag Officer Carrier Training and Administration in September, 1945, and will continue to serve in the acting rank of Rear-Admiral. Rear-Admiral Bridge will be given another appointment shortly.

Royal Air Force

THE Air Ministry announces the following R.A.F. appointments:—

Air Vice-Marshal F. F. INGLIS, C.B.E., to be Air Officer Commanding No. 23 Group, Flying Training Command.

Air Vice-Marshal T. W. ELMHIRST, C.B., C.B.E., A.F.C., to be assistant chief of the Air Staff (Intelligence).

Air Comdre. M. L. TAYLOR, C.B.E., A.F.C., to be Senior Air Staff Officer, H.Q., Flying Training Command, and to be Act. Air Vice-Marshal.

Air Vice-Marshal Inglis has been engaged on intelligence work since 1936, having been a deputy director of intelligence, then director, and latterly, assistant chief of the Air Staff (Intelligence), which post he has held since October, 1942.

Air Vice-Marshal Elmhirst has been air officer in charge of administration at H.Q., 2nd T.A.F. since November, 1943. He previously held a similar post with the T.A.F., N.W. Africa and Air H.Q., Libya, and was Air Officer Commanding H.Q., Egypt in 1941. In December, 1940, he was a member of the Military Mission to Turkey.

Awards

Naval Air Arm

FOR outstanding courage, determination and skill while serving in H.M. Ships *Nairana* and *Campania* in escorting a convoy to and from North Russia under continuous and fierce attacks by the enemy and in exceptionally hard weather conditions.

Bar to Distinguished Service Cross

Temp. Lt. (A) R. A. FLEISCHMANN-ALLEN, D.S.C., R.N.V.R.

Distinguished Service Cross

Temp. Lt. (A) S. A. MEARNS, R.N.V.R.
Temp. Lt. (A) J. A. QUIGG, R.N.Z.N.V.R.
Temp. Sub. Lt. (A) P. J. W. DAVIES, R.N.V.R.
Temp. Sub. Lt. (A) G. D. GORDON, R.N.V.R.
Temp. Sub. Lt. (A) O. K. ARMITAGE, R.N.Z.N.V.R.

FOR bravery, skill and undaunted devotion to duty in an offensive air sweep and hazardous reconnaissance operations in the Far East.

Distinguished Service Cross

Temp. Sub. Lt. (A) SACHNOVSKY, R.N.V.R.
Temp. Sub. Lt. (A) R. J. FOXLEY, R.N.Z.N.V.R.
Temp. Sub. Lt. (A) J. S. MCNEE, R.N.V.R.

FOR courage, daring and tenacity, whilst serving in H.M.S. *Searcher* in air strikes off the coast of Norway under very difficult weather conditions.

Distinguished Service Cross

Temp. Act. Sub. Lt. (A) A. F. WOMACK, R.N.V.R.

FOR gallantry, determination and devotion to duty in carrying out a successful air operation in the face of heavy opposition.

Distinguished Service Cross

Lt. (A) G. F. CORNISH, R.N.

FOR gallantry and outstanding devotion to duty, whilst engaged in test-flying operations.

Posthumous Commendation

Lt. Cdr. (A) F. C. FURLONG, R.N.V.R.

Royal Air Force

THE KING has been graciously pleased to approve the following awards in recognition of gallantry and devotion to duty in the execution of air operations:—

Bar to Distinguished Service Order

Act. Wing Cdr. R. H. HARRIES, D.S.O., D.F.C., R.A.F.V.R.—This officer has been engaged in operational flying since 1940 and has destroyed at least 20 enemy aircraft. He has been operations wing commander of his wing throughout the strenuous period which followed the invasion of Normandy. During this time Wing Cdr. Harries took part in numerous long escort sorties and in bombing and close support missions. Since the award of the D.S.O., he has destroyed one enemy aircraft and damaged others. Under all circumstances, in the face of adverse weather and heavy enemy opposition, he has displayed outstanding leadership and gallantry.

Wing Cdr. G. C. KEEFER, D.S.O., D.F.C., R.C.A.F.—Since his appointment as wing commander operations, Wing Cdr. Keefer has led and trained his wing to a high pitch of keenness and efficiency. Under his leadership, the wing has destroyed 191 enemy aircraft and damaged many more. In addition, a great variety of enemy ground targets have been successfully attacked. During this period, Wing Cdr. Keefer has destroyed four enemy aircraft in the air, bringing his total victories to 12 aircraft destroyed. He has also destroyed at least 60 enemy transport vehicles. In April, 1945, he completed a daring attack on eleven Messerschmitt 109s, assembled on an airfield at Parchin. Despite intense and accurate anti-aircraft fire the attack was pressed home and all the enemy aircraft were destroyed. This officer has completed three tours of operational duty and has proved himself to be a leader of the highest order and a cool and fearless pilot.

Distinguished Service Order

F/O. K. V. PANTER, R.A.F.V.R.—This officer has completed a very large number of sorties against a wide variety of targets. In attacks on the enemy's railway system, he has been responsible for the destruction of three locomotives. On one occasion he attacked an industrial building south of Gourney, setting it on fire. In February, 1945, F/O Panter took part in an attack on various enemy airfields. Whilst attacking the airfield at Landau his aircraft was engaged by a superior force of enemy fighters and sustained very severe damage. A little later the aircraft was hit by fire from the ground defences. It became necessary to abandon the aircraft. The navigator had apparently been hit and was dazed. In most difficult circumstances F/O. Panter coolly assisted his comrade to leave the aircraft before jumping himself. F/O. Panter came down safely in enemy country and was captured. He was released when Frankfurt was captured by the Allies. On this occasion his example of courage and resolution were well in keeping with that which he has shown throughout his tour of operational duty.

Act. Sqn. Ldr. F. W. LISTER, D.F.C., R.A.F.V.R., No. 127 Sqn.—During his second tour of operational duty, this officer has participated in all types of fighter sorties against the enemy. He has shown conspicuous bravery on fighter patrols, escort missions and in attacks on enemy mechanical transport, rolling stock and barges. Sqn. Ldr. Lister was shot down and wounded early in his second tour of duty. Undeterred,

SERVICE AVIATION

he returned to operational duty with great enthusiasm and keenness. Since the award of the D.F.C. he has destroyed at least two enemy aircraft in the air and four on the ground, in addition to many transport vehicles.

Act. Sqn. Ldr. A. P. MILLAR, D.F.C., R.A.F.V.R., No. 20 Sqn.—Since the award of the D.F.C. in January, 1943, Sqn. Ldr. Millar has participated in numerous operational missions. Since January, 1945, under this officer's superb leadership, his squadron has destroyed or damaged approximately 350 mechanised vehicles, 25 tanks, a very large number of ammunition and stores dumps, buildings and river craft, and Sqn. Ldr. Millar's excellent example and personal achievements have been largely responsible for the high standard of efficiency of the squadron.

Act. Wing Cdr. J. C. BUTTON, D.F.C., R.A.F.V.R.—Wing Cdr. Button has led his wing in an outstanding manner throughout the intensive period of operations since January, 1945. In February, 1945, his wing gave the closest possible support to the Army in the Hochswald and Reichswald areas, where, in spite of intense anti-aircraft opposition, many strong points, gun positions and enemy concentrations were successfully attacked under his leadership. During March, 1945, Wing Cdr. Button led rocket and bombing attacks on at least nine enemy headquarters. During the crossing of the Rhine, his wing was detailed to operate against enemy anti-aircraft guns. His courage and keenness during this operation was specially marked and proved an inspiration to all under his command. Wing Cdr. Button has also taken part in attacks on enemy shipping. He has set a fine example of initiative and courage in action.

Act. Wing Cdr. A. WEBSTER, D.F.C., R.A.F.O., No. 99 Sqn.—Since the award of the D.F.C., Wing Cdr. Webster has taken part in numerous missions operating, since May, 1942, from Burma. These sorties have included low-level attacks against enemy shipping, which, despite intense enemy opposition, have resulted in the destruction of several merchant vessels. He has also taken part in several long-range formation attacks of more than 16 hours' duration against vital enemy lines of communication. This officer has led his squadron with distinction in low-level sorties against bridges, enemy supplies and installations in heavily defended areas, pressing home his attacks to the utmost. At all times Wing Cdr. Webster has displayed courage and skill of the highest order and as a flight commander his outstanding leadership and personal example have materially contributed to the outstanding achievements of the squadron.

Act. Sqn. Ldr. A. N. DAVIS, D.F.C., R.A.F., No. 16 Sqn.—Since the award of the D.F.C., Sqn. Ldr. Davis has been engaged continuously on photographic reconnaissance work. He has proved himself a skilful and courageous pilot who has never failed to obtain excellent photographs even in the face of intense opposition. On four occasions he has been attacked by formations of enemy aircraft, but he has always outmanœuvred his assailants successfully. On one of his missions over the Dortmund-Ems canal his port wing petrol tank was hit by anti-aircraft fire. Despite the loss of fuel and damage sustained, Sqn. Ldr. Davis continued with his allotted task and secured some fine results He has commanded his squadron for a period of eight months, during which time he has displayed exceptional qualities of determination, leadership and judgment.

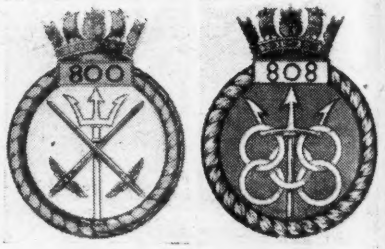
Bar to Distinguished Flying Cross

Sqn. Ldr. H. W. RADFORD, D.F.C., No. 463 (R.A.A.F.) Sqn.
Act. Sqn. Ldr. W. E. EAGLETON, D.F.C., R.A.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Flt. Lt. J. EPSTEIN, D.F.C., R.A.A.F., No. 7 Sqn.
Flt. Lt. J. E. FRANCIS, D.F.C., R.C.A.F., No. 434 (R.C.A.F.) Sqn.
Flt. Lt. V. T. WOODS, D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.
Act. Flt. Lt. J. D. DUNCAN, D.F.C., R.C.A.F., No. 83 Sqn.
Act. Flt. Lt. L. V. J. SMALL, D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.
F/O. R. G. BOYDEN, D.F.C., R.C.A.F., No. 627 Sqn.
F/O. J. A. PETERSON, D.F.C., R.C.A.F., No. 9 Sqn.
Act. Wing Cdr. R. W. F. SAMPSON, D.F.C., R.A.F.V.R.
Sqn. Ldr. F. G. WOOLLEY, D.F.C., R.A.F.V.R., No. 130 Sqn.
Major G. B. LIPAWSKY, D.F.C., S.A.A.F. No. 1 (S.A.A.F.) Sqn.
Major H. O. M. ODENDAAL, S.A.A.F., No. 5 Sqn.
Flt. Lt. J. D. YOUNIE, D.F.C., R.A.F.V.R., No. 249 Sqn.
Act. Sqn. Ldr. A. FREEDMAN, D.F.C., R.A.F.V.R., No. 254 Sqn.
Act. Sqn. Ldr. H. H. K. GUNNIS, D.F.C., R.A.F.V.R., No. 248 Sqn.
Act. Sqn. Ldr. J. H. SPURGEON, D.F.C., R.A.F.V.R., No. 502 Sqn.
Flt Lt. R. E. JONES, D.F.C., R.A.F.V.R., No. 455 (R.A.A.F.) Sqn.

Distinguished Flying Cross

Act. Wing Cdr. F. G. PAISEY, R.A.F.V.R., No. 354 Sqn.
Flt. Lt. H. J. BROWN, R.A.F.V.R., No. 18 Sqn.
Flt. Lt. H. PEARS, R.A.F.V.R., No. 175 Sqn.
Capt. R. C. EGNER, S.A.A.F., No 3 S.A.A.F.) Sqn.
Lt. D. R. BOND, S.A.A.F., No. 15 (S.A.A.F.) Sqn.
P/O. J. A. H. WHIPPLE, R.C.A.F., No. 426 (R.C.A.F.) Sqn.
Sqn. Ldr. W. C. DUNCAN, R.A.F., No. 613 Sqn.
Sqn. Ldr. R. S. EASBY, R.A.F.V.R., No. 66 Sqn.
Act. Sqn. Ldr. J. C. ALLISON, R.A.F.V.R., No. 88 Sqn.
Act. Sqn. Ldr. A. Ll. WILLIAMS, R.A.F.V.R., No. 106 Sqn.
Flt. Lt. F. C. W. CLEMENT, R.A.F.V.R., No. 106 Sqn. (since deceased)
Flt. Lt. R. J. COOMBS, R.A.F.V.R., No. 487 Sqn.
Flt. Lt. G. J. KING, R.A.F.V.R., No. 609 Sqn.
Flt. Lt. G. B. MILNE, R.A.F.V.R., No. 56 Sqn.
Flt. Lt. W. R. OWEN, R.A.F.V.R., No. 35 Sqn.
Flt. Lt. H. R. SELKIRK, R.A.F., No. 2 Sqn.
Flt. Lt. J. G. SIMPSON, R.A.F.V.R., No. 193 Sqn.
Flt. Lt. R. F. SWEETING. R.A.F., No. 174 Sqn.
Flt. Lt. J. T. R. TAYLOR, R.A.F.V.R., No. 7 Sqn.
Flt. Lt. G. W. VARLEY, R.A.F., No. 222 Sqn.

FREEMEN OF CAMBRIDGE : The Mayor of Cambridge, Councillor George Wilding, handing the casket containing the Scroll of Freedom to Major Gen. Kepner, commanding the U.S. 8th A.A.F. on the occasion of the conferring of the Honorary Freedom of Cambridge on the U.S. 8th A.A.F.



(Left) Badge of No. 800 Squadron, Naval Air Arm, "Nunquam non Paratas" (Never Unprepared). On a blue field, in front of a trident erect, two winged swords in saltire, gold. (Right) Badge of No. 808 Squadron, Naval Air Arm, "Strength in Unity." On an azure field, five rings, argent, interlocked to form 808 interlaced with a trident, gold.

Act. Flt. Lt. G. G. H. FABARA, D.F.M., R.A.F.V.R., No. 630 Sqn. (since deceased).
F/O. J. K. BARRETT, R.A.F.V.R., No. 207 Sqn. (since deceased).
F/O. M. A. COLLINS, D.F.M., R.A.F.V.R., No. 226 Sqn.
F/O. N. G. FAZAN, R.A.F.V.R., No. 219 Sqn.
F/O. W. HANNAH, R.A.F.V.R., No. 97 Sqn (since deceased).
F/O. F. D. HAWKINS, R.A.F.V.R., No. 107 Sqn.
F/O. A. HOLT, R.A.F.V.R., No. 21 Sqn.
F/O. A. T. LINN, R.A.F.V.R., No. 605 Sqn.
F/O. R. J. A. MACLEOD, R.A.F.V.R., No. 88 Sqn
F/O. D. A. STOTT, R.A.F., No. 130 Sqn.
F/O. W. J. TYTHERLIEGH, R.A.F.V.R., No. 50 Sqn. (since deceased).
F/O. E. P. WARING, R.A.F.V.R., No. 107 Sqn.
F/O. J. H. WICKEN, R.A.F.V.R., No. 418 (R.C.A.F.) Sqn.
P/O. W. OTTLEY, R.A.F.V.R., No. 207 Sqn. (since deceased)
W/O. P. H. T. CLAY, R.A.F.V.R., No. 130 Sqn.
W/O. W. HARRISON, R.A.F.V.R., No. 605 Sqn
W/O. B. G. LEIGH, R.A.F.V.R., No. 33 Sqn.
Act. F/O. E. F. REID, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Flt. Lt. R. D. THOMAS, R.C.A.F., No. 418 (R.C.A.F.) Sqn.
Flt. Lt. N. J INGRAM, D.F.M., R.N.Z.A.F., No. 21 Sqn.
Flt. Lt. K. W. STEWART, R.N.Z.A.F., No. 488 (R.N.Z.A.F.) Sqn.
F/O. M. A. BARRY, R.N.Z.A.F., No. 107 Sqn.
F/O. H. E. BRUMBY, R.N.Z.A.F., No. 488 (R.N.Z.A.F.) Sqn.
F/O. G. L GAMBLE, D.F.M., R.A.F., No. 149 Sqn.
F/O. J H. GOWAN, R.A.F.V.R., No. 622 Sqn.
F/O W. H. HUGHES, D.F.M., R.A.F.V.R., No. 692 Sqn.
F/O. I. A. JACKSON, R.A.F.V.R., No. 640 Sqn.
F/O. J. P. OLIVER, D.F.M., R.A.F.V.R., No. 102 Sqn.
F/O. R. PHILLIPS, R.A.F.V.R., No. 169 Sqn.
F/O. J. SIMKIN, D.F.M., R.A.F.V.R., No. 692 Sqn.
F/O. L W. SKIPPER, R.A.F.V.R., No. 158 Sqn.
F/O. L. TODD, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
P/O. R ASQUITH, R.A.F.V.R., No. 76 Sqn.
P/O. D. R. ATTWOOD, D.F.M., R.A.F.V.R., No. 619 Sqn.
P/O. B. C. BULL, D.F.M., R.A.F.V.R., No. 15 Sqn.
P/O. F. S COPESTAKE, D.F.M., R.A.F.V.R., No. 105 Sqn.
P/O. F. R. COX, D.F.M., R.A.F.V.R., No. 7 Sqn.
P/O. L E. CUNNINGHAM, R.A.F.V.R., No. 10 Sqn.
Act. Flt. Lt. G. G. KENNEDY, R.A.F.V.R., No. 150 Sqn.
Act. Flt. Lt. T. P. LAWRENSON, R.A.F.V.R., No. 105 Sqn.
Act. Flt. Lt. W. A. C. LEE, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt A D. MANT, R.A.F.V.R., No. 77 Sqn.
Act. Flt. Lt. R. MATHER, R.A.F.V.R., No. 227 Sqn.
Act. Flt. Lt. G. MUAT, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt. V. A. MURPHY, R.A.F.V.R., No. 635 Sqn.
Act. Flt. Lt. W. G PALMER, R.A.F.V.R., No. 35 Sqn.
Act. Flt. Lt. R. N. PEREIRA, R.A.F.V.R., No. 83 Sqn.
Act. Flt. Lt. G. P. PICKERING, R.A.F.V.R., No. 115 Sqn.
Act. Flt. Lt. D. S. RICHARDS, R.A.F.V.R., No. 576 Sqn.
Act. Flt. Lt. F. T. SCHOLES, R.A.F.V.R., No. 214 Sqn.
Act. Flt. Lt C. R. E. SHANKS, R.A.F.V.R., No. 640 Sqn.
Act. Flt. Lt. W. R. SHARP, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt, R W SPARKES, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt W. STEWART, R.A.F.V.R., No. 149 Sqn.
Act. Flt. Lt. R. H. TAYLOR, R.A.F.V.R., No. 170 Sqn.
Act. Flt. Lt. E. G. THOMAS, R.A.F.V.R., No. 635 Sqn.

Act. Flt. Lt. J. H. WADE, R.A.F.V.R., No. 90 Sqn.
P/O. K. THORNLEY, R.A.F.V.R., No. 150 Sqn.
P/O. G. A. THURSBY, R.A.F.V.R., No. 102 Sqn.
P/O. M. W. TURLAND, R.A.F.V.R., No. 582 Sqn.
P/O. F. V. WALTON, R.A.F.V.R., No. 156 Sqn.
P/O. F. J. WATSON, R.A.F.V.R., No. 15 Sqn.
P/O. D. R. W. WHITTAKER, R.A.F.V.R., No. 75 (N.Z.) Sqn.
P/O. V. T. M. WILKES, R.A.F., No. 150 Sqn.
P/O. N. F. WILSON, R.A.F.V.R., No. 75 (N.Z.) Sqn.
W/O. S. A. ANDERSON, R.A.F.V.R., No. 15 Sqn.
W/O. J. H. BRABAZON, R.A.F.V.R., No. 186 Sqn.
W/O. T. C. CARTON, R.A.F.V.R., No. 692 Sqn.
W/O. W. LANE, R.A.F.V.R., No. 128 Sqn.
W/O. D. E. MEREDITH, R.A.F., No. 195 Sqn.
W/O. R. MOODIE, R.A.F.V.R., No. 142 Sqn.
W/O. J. MORAN, R.A.F.V.R., No. 514 Sqn.
W/O. W. F. PREWER, R.A.F.V.R., No. 15 Sqn.
W/O. W. REAVLEY, R.A.F.V.R., No. 75 (N.Z.) Sqn.
W/O. J. L. SHOWELL, R.A.F., No. 115 Sqn.
W/O. W. C. THOMLINSON, R.A.F.V.R., No. 571 Sqn.
W/O. D. H. VAUGHAN, R.A.F.V.R., No. 617 Sqn.
W/O. R. VERE, R.A.F.V.R., No. 635 Sqn.
W/O. L. WALKER, R.A.F.V.R., No. 115 Sqn.
W/O. D. H. WILLIAMS, R.A.F., No. 218 Sqn.
W/O. G. A. WHITBY, R.A.F.V.R., No. 630 Sqn.
W/O. E. WITHERS, R.A.F.V.R., No. 97 Sqn.
W/O. W. YOUNG, R.A.F.V.R., No. 571 Sqn.
W/O. C. L. RANSFORD, R.A.F.V.R., No. 635 Sqn.

Conspicuous Gallantry Medal (Flying)

W/O. K. J. DENNIS, R.A.A.F., No. 462 (R.A.A.F.) Sqn.—One night in March, 1945, this officer was wireless operator in an aircraft detailed to attack Frankfurt. Shortly after leaving the target the aircraft was hit and severely damaged by anti-aircraft fire. One member of the crew was killed and W/O. Dennis was badly wounded. The latter was hit in both legs and most of the foot of one of them was severed. Despite his wounds and the loss of much blood, W/O. Dennis continued with his duties until the aircraft had landed. Although suffering great physical distress, this officer displayed courage, determination and devotion to duty of the highest order.

Flt. Sgt. D. EVANS, R.A.F.V.R., No. 250 Sqn.—Flt. Sgt. Evans has displayed the highest standard of keenness, courage and devotion to duty. He has completed very many sorties and has at all times pressed home his attacks with great determination. In April, 1945, this airman was engaged on an armed reconnaissance in Northern Italy. A convoy of enemy vehicles were sighted. During the attack his aircraft was hit and severely damaged by anti-aircraft fire. Undeterred, he pressed home his attack, destroying two enemy vehicles. Later, Flt. Sgt. Evans was compelled to abandon his crippled aircraft. He came down safely by parachute. Although landing in enemy territory he evaded capture and soon rejoined his squadron. He displayed great courage and tenacity throughout.

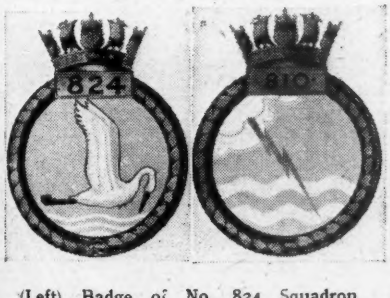
Distinguished Flying Medal

Flt. Sgt. B. F. BAILEY, R.A.F.V.R., No. 159 Sqn.
Flt. Sgt. (later P/O.) T. J. GOSLING, R.A.F.V.R., No. 40 Sqn. (since deceased).
Flt. Sgt. G. D. LEACH, R.A.F.V.R., No. 40 Sqn.
Flt. Sgt. R. H. PENNELLS, R.A.F.V.R., No. 83 Sqn. (since deceased).
Act. Flt. Sgt. B. G. TUCKER, R.A.F.V.R., No. 83 Sqn. (since deceased).
Sgt. R. F. OWEN, R.A.F.V.R., No. 31 (S.A.A.F.) Sqn.
Sgt. G. W. W. WIEGAND, R.A.F.V.R., No. 547 Sqn.

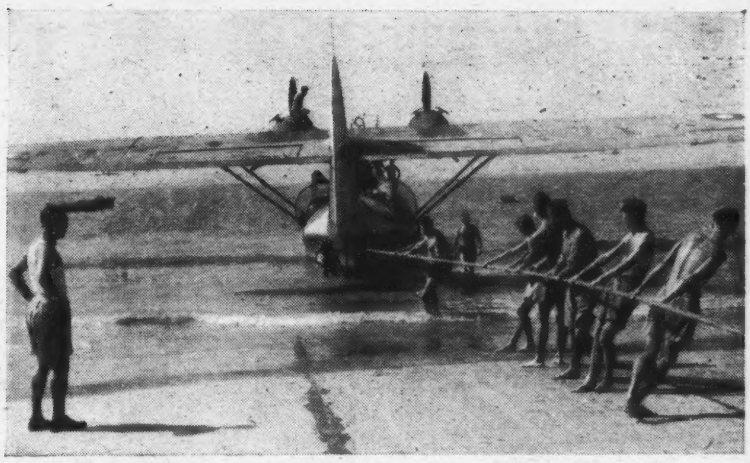
THE KING has been graciously pleased to approve the following awards

Military Cross

Act. Wing Cdr. R. T. F. TURNER, D.F.C., R.A.F.V.R., No. 190 Sqn.
F/O. R. A. CARSON, R.A.V.R., No. 222 Sqn.
Act. Sqn. Ldr. D. T. LEES, R.A.F.



(Left) Badge of No. 824 Squadron, Naval Air Arm, "Spectat Ubique Spiritus" (The wind everywhere looks on) On a blue field, over water in base barry wavy white and blue, a great white heron flying to the sinister proper. (Right) Badge of No. 810 Squadron, Naval Air Arm, "Ut Fulmina de Caelo" (Like thunderbolts from heaven). On a field blue in base, barry wavy white and blue, issuing from clouds white, a ray of lightning, gold.



MAINTENANCE CHECK : A Catalina being hauled up the slipway at the R.A.F station at Korangi Creek, Karachi, India.

Roll of Honour

Casualty Communiqué No. 531.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 173 are second entries giving later info-mation of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—F/O. A. J. Aust; F/O. L. W. C. Austin; Sgt. G. N. Barker; Flt. Lt. D. J. Baum; Sgt. P. R. J. Bosley; Sgt. F. C. Collis; Sgt. R. V. Cremins; F/O. D. C. Davies; Sgt. J. E. Dent; Flt. Lt. J. V. Evans; Sgt. E. A. J. Farrow; F/O. N. Gillin; P/O. A. R. Grimstone, D.F.M.; F/O. J. P. Halestrap; Sgt. R. Hall; F/O. D. J. Harris; Flt. Sgt. R. H. Houldey; F/O. T. S. Hunter; W/O. H. F. Kirk; Flt. Sgt. J. W. Middleton; Flt. Sgt. K. Morison; Sgt. B. H. Mowbray; P/O. C. J. W. Muir; F/O. A. M. Payne; Sgt. T. Platt; Sgt. G. Preston; Flt. Lt. C. A. Rogers; Sgt. J. A. W. Smith; F/O. J. E. Tibbetts; Sgt. R. Todd; Flt. Sgt. R. Warne; Sgt. J. A. Wingrove; P/O. B. W. Yearsley.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. J. A. Edward, D.F.C.; Flt. Sgt. L. L. Ruddock; Sgt. R. G. Silver.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. P. Alton; Sgt. E. D. Anderson; Flt. Sgt. A. Baker; P/O. J. J. Bambury; Flt. Sgt. D. N. Bishop; F/O. R. J. Bordiss; Sgt. I. Bowley; Flt. Sgt. F. D. Brandon; Flt. Sgt. J. E. Brandon; Flt. Sgt. E. Brunt; Sgt. T. H. Burke; Flt. Sgt. W. A. Butcher; Flt. Sgt. J. N. Carter; F/O. A. Clarkson; Flt. Lt. R. T. Clarke; Sgt. J. H. Codd; Flt. Sgt. D. N. Cole; Flt. Sgt. P. M. Constable; Sgt. W. J. Cook; P/O. F. Copland; Sgt. T. F. Craddock; Sgt. A. W. Crooke; Flt. Lt. A. Dalrymple; Sgt. F. W. Day; Sgt. S. V. Day; Sgt. R. J. Dodgson; F/O. W. T. Dryburgh; F/O. W. Eaton; Sgt. E. C. Edwards; W/O. M. J. Fahey; Sgt. A. Farmer; Sgt. L. G. Fereday; Sgt. E. Fitton; Flt. Sgt. D. A. Fraser; Sgt. W. T. Freeman; Sgt. G. E. Frost; Flt. Sgt. F. J. H. Garrick; Sgt. G. Goddard; Sgt. B. W. Golding; Sgt. R. Goodacre; Sgt. E. A. Gouldie; Flt. Sgt. E. Hambling; Sgt. R. R. Hardey; F/O. F. S. Harris; Flt. Sgt. A. A. Holt; Sgt. R. Hood; F/O. F. Hosier; W/O. J. W. Hutton; Flt. Sgt. R. D. W. Jamieson; F/O. W. L. Jarvis; Sgt. C. Jelley; Flt. Sgt. R. Johnson; Sgt. R. M. W. Johnson; Sgt. G. R. Jones; Flt. Sgt. E. W. Julier; F/O. H. J. Kadwill; P/O. W. H. Kent; P/O. P. Kettles-Roy; Sgt. H. H. Kidd; F/O. L. W. J. King, D.F.C.; Sgt. F. N. Knapp; Sgt. A. F. Kneller; Sgt. J. M. Knott; F/O. J. L. Larsen; Sqn. Ldr. D. Leatherland; Flt. Sgt. J. A. Ligertwood; Sgt. R. Lundy; Sgt. J. McAllister; Sgt. A. McCluskie; Flt. Sgt. B.McDonagh, G.M.; Flt. Sgt. G. McEwan; P/O. L. C. Margetts; P/O. R. J. Messer; W/O. G. Muckart; Sgt. H. C. Munns; Sgt. G. H. Nairn; Sgt. F. R. Nicholls; Flt. Lt. S. G. Norris; Sgt. E. A. O'Connor; Sgt. E. A. Parker; P/O. H. Parrott; Flt. Sgt. E. H. Paton; Sgt. E. Pattison; Flt. Sgt. D. W. Plumley; P/O. E. N. Powell; Sgt. D. Prewer; P/O. H. J. F. Pridgett; Sgt. J. Ridley; Sgt. D. F. Rimmer; Sgt. J. G. Robson; P/O. H. Rogers; W/O. H. T. Rolph; F/O. L. G. Rolton, D.F.C.; Flt. Lt. I. W. Saunders; P/O. D. Schofield, D.F.M.; Sgt. J. Y. Scott; Sgt. W. S. Singfield; Sgt. R. V. Skeates; Sgt. R. Smedley; Flt. Lt. H. A. F. Smith; F/O. T. H. Speller; Sgt. J. Spencer; Sgt. H. R. Spendelow; Flt. Sgt. D. G. W. Stewart; Sgt. A. W. Swindell; Flt. Sgt. L. M. Talbot; Sgt. J. Torode; Sgt. V. F. T. Trumper; Flt. Sgt. J. A. Van-Marle; Sgt. T. D. Ward; Sgt. W. Watkins; Sgt. H. B. West; Sgt. R. Whalley; F/O. R. F. Wilden; Sgt. K. J. Willett; Flt. Sgt. R. Withinshaw.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—W/O. W. D. B. Allen; Sgt. D. D. Pettit; F/O. W. I. D. Smith.

WOUNDED OR INJURED IN ACTION.—Sgt. A. Tait.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. B. Jones; Flt. Lt. W. A. Jones; Flt. Lt. D. M. Leitch; Flt. Sgt. D. R. Phillips; Sqn. Ldr. G. M. Smith; Flt. Sgt. W. Longmore.

MISSING.—F/O. K. A. Ayres; Sgt. G. H. Armstrong; Flt. Sgt. N. D. Askill; F/O. W. J. Bailey; Sgt. J. Barton; F/O. C. W. Baush; Sgt. D. W. S. Bay; Flt. Sgt. H. Bedford; Flt. Sgt. E. C. Berg; Sgt. J. Bryce; Flt. Sgt. G. Cartwright; Sgt. H. Castle; Sgt. J. A. Chambers; Sgt. R. M. Cocozza; Flt. Sgt. C. Cole; Flt. Sgt. N. Cooper; Sgt. D. Cox; Flt. Sgt. S. Craddock; Sgt. J. Davies; F/O. C. J. Day; Sgt. R. J. Dickson; Sgt. J. Dixon; Sgt. T. N. Dunlop; F/O. C. E. Eyles; F/O. B. W. Eynon; Sqn. Ldr. D. H. Fenton; W/O. D. Forbes; P/O. E. W. Gibbins; Sgt. B. T. Gough; F/O. S. C. Hawkins; Flt. Sgt. D. Head; Flt. Sgt. C. F. J. Hole; Sgt. J. W. Horne; Sgt. J. Howard; F/O. D. N. King; Sgt L. King; Sqn. Ldr. R. Lane; Flt. Sgt. D. R. Lloyd; Flt. Sgt. R. J. McMinn; Sgt. A. MacNair; P/O. M. W. Mair; Sgt. W. B. Meechan; Sgt. J. Mitchell; F/O. E. J. S. Morris; Sgt. D. F. McShane; Sgt. C. Q. Rafferty; Sgt. G. Rough; Sgt. N. Russell; Sgt. J. F. Shearon; P/O. W. L. Shield; Sgt. W. Simpson; Sgt. A. R. Stafford; Sgt. K. R. Still; Flt. Sgt. J. L. Stone; F/O. E. Stubbs; Sgt. W. C. Taylor; P/O. R. D. Temple; Flt. Sgt. G. J. Thomas; Flt. Sgt. J. E. Thompson; F/O. J. Walmsley; Sgt. E. T. West; Flt. Sgt. D. S. Whitehouse; F/O. H. W. B. Wiley; Sgt. R. Wilson.

KILLED ON ACTIVE SERVICE.—Sgt. R. C. Banks; Sgt. L. G. B. Edmonds; P/O. E. H. Ewin; Sgt. G. W. Flitt; Flt. Sgt. A. Henderson; F/O. J. Hooper; F/O. W. W. Lord; L.A/C. J. Morrison; Sgt. W. G. Mowbray; Flt. Sgt. H. O'Hagan; Flt. Lt. F. T. Reynolds; Sgt. R. Richardson; Flt. Lt. E. G. Sheppard; F/O. W. D. Waller; Flt. Sgt. F. G. Ward; Sgt. G. Wilkinson; Sgt. N. S. Willison.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. A. P. R. Hobbs.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. S. J. Furneaux; Flt. Lt. F. C. Neville.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—W/O. J. F. Alexander; L.A/C. S. Pankhurst.

DIED ON ACTIVE SERVICE.—A/C.2 F. J. Allard; Flt. Sgt. A. F. Baron; L.A/C. L. J. Cook; L.A/C. J. J. Harrison; L.A/C. J. H. Hatton; Cpl. A. H. Hewitt; Sgt. R. Johnson; A/C.1 D. McMillan; L.A/C. W. W. McK. Ross; Sgt. K. C. Ryland.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Lt. H. J. Bray, D.F.C.; F/O. K. R. Brook, D.F.C.; Flt. Lt. M. H. M. Maclean.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. C. O'Brien; P/O. L. C. Potter; Flt. Sgt. W. J. Simpson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—F/O. F. E. Neider.

MISSING.—F/O. B. E. Barrow; W/O. J. B. Cossart; Flt. Sgt. R. K. Locke; F/O. C. D. Pauline.

KILLED ON ACTIVE SERVICE.—Flt. Lt. E. McM. Lawson.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. B. K. White.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—P/O. J. S. Blair; F/O. P. Steffin.

SERVICE AVIATION

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. C. E. Gardener.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. H. T. Crampton; W/O. K. Duddlng.

MISSING.—F/O. R. G. D. Adlam; Flt. Sgt. P. N. Black; F/O. R. N. Ferguson; F/O. C. P. Sparkes.

KILLED ON ACTIVE SERVICE.—Flt. Lt. L. S. Black, D.F.C.

South African Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Lt. F. W. Begbie; Lt. D. Brooksbank; 2nd Lt. M. J. W. Brummer; Lt. D. J. De Villiers; Capt. J. O. De Waal; 2nd Lt. W. W. S. Facer; Lt. M. Friedland; Lt. J. K. H. Guest; W/O. J. V. Hamilton; Lt. J. H. Jooste; Capt. K. G. Muir; W/O. F. Rice; Lt. E. Robarts; Lt. M. Rosendorf; Lt. J. H. Strydom; Lt. W. F. Wells.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. A. B. Aeken; 2nd Lt. A. M. Bain; Maj. J. E. Bell; Capt. P. H. Bosch; Lt. G. A. Bowles; Lt. J. E. Brant; W/O. C. W. E. Chabot; W/O. T. P. Deetlefs; Flt. Sgt. G. A. Dingle; Lt. G. M. H. Duplessibe; Air Sgt. J. F. Fourie; Capt. G. Frolich; Flt. Sgt. K. R. Healy; Maj. H. A. Job; Flt. Sgt. Johnson; Lt. F. W. Phillips; Flt. Sgt. P. J. Pretrius; Lt. G. P. Rowe; 2nd Lt. Rutkin; Flt. Sgt. S. Smith; Lt. R. M. P. Stuart; 2nd Lt. A. Thompson; Lt. J. P. Van Epen; Lt. E. Veckerman.

WOUNDED OR INJURED IN ACTION.—W/O. D. Allington.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—2nd Lt. C. A. Wright.

MISSING.—Lt. L. Badenhorst; Lt. N. J. Henneke; W/O. E. A. Kruger; Lt. C. G. Richardson; Lt. H. A Sholto-Douglas; W/O. J. U. C. Snell.

DIED ON ACTIVE SERVICE.—Air Mech. W. J. Chapman; Air Mech. M. K. S. Clarke; Air Mech. E. Grant; Air Mech. B. J. Hamman; Air Mech. G. A. G. Marrs.

Casualty Communique No. 532

Of the names in this list, 151 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. A. W. Darling; Flt. Sgt. C. K. Fielder; W/O. H. Holmes; Flt. Sgt. A. Howard; F/O. K. C. Millar; Sgt. W. J. Pullan; Flt. Lt. K. Robinson; Sgt. A. W. Taylor; Flt. Sgt. D. H. G. Tiley; Flt. Sgt. J. H. W. Turner.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. N. Bage; Flt. Sgt. J. Blackburn; Flt. Sgt. J. W. R. Cox; Flt. Sgt. C. H. Dean; Sgt. J. S. Francis; P/O. F. C. Hampton; Sgt. A. E. Homes; Sgt. R. McCafferty; F/O. R. S. Mallett, D.F.C.; Flt. Sgt. W. W. Scott; Flt. Sgt. D. W. Taylor; Flt. Sgt. I. F. Wheatley.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. R. McL. Adam; Sgt. P. A. O. Adams; Flt. Sgt. L. D. Anderson; Sgt. J. Armstrong; P/O. W. H. Austin; Flt. Lt. G. E. Ball, D.F.C.; Sgt. B. S. Barber; Sgt. C. C. Barnes; Sgt. M. Barss; Wing Cdr. R. K. F. Bell-Irving; Flt. Sgt. R. W. Bishop; Sgt. S. Bosworth; Sgt. D. G. N. Boyce; Flt. Sgt. C. G. Bromham; Sgt. J. F. Brunton; F/O. G. Buxton; Sgt. F. J. Castle; Sgt. B. J. Chillingworth; P/O. F. Clark; Sgt. R. L. Coaker; Sgt. T. R. Connatty; Sgt. D. A. Cossey; Flt. Sgt. R. G. Craddock; Sgt. S. R. Crate; F/O. G. H. Cruwys; Flt. Sgt. W. J. Daly; Sgt. H. McL. Donnelly; Sgt. J. A. Durkin; Sgt. G. H. Eaton; Sgt. F. J. Edwards; Sgt. J. N. Elliott; F/O. G. Elmy; Sgt. J. D. Elvin; Flt. Sgt. E. G. M. Eyres; Flt. Sgt. S. Fawcett; Sgt. F. W. Fuce; Sgt. K. Gardiner; F/O. J. A. Garrett; Sgt. A. McP. Geddes; Sgt. J. Gommo; Sgt. E. Hankinson; P/O. A. Hansford; F/O. G. J. Harden, D.F.C.; Flt. Sgt. F. J. N. Hickson; Flt. Sgt. K. G. Hodnett; P/O. R. H. P. Hollander; Flt. Sgt. F. W. Hubbard; Sgt. D. G. Hughes; Sgt. R. J. Humbles; Sgt. A. W. Hurr; Sgt. R. Hydes; Flt. Sgt. R. I. Hyslop; F/O. G. W. Ingham; Sgt. D. Jagger; Flt. Sgt. E. Jeal; Flt. Sgt. D. Joyce; P/O. J. Kernahan; Sgt. B. M. Kimber; Sgt. F. C. Kimber; Sgt. F. D. King; Sgt. J. A. Kirwan; Sgt. A. S. Lewis; Flt. Sgt. C. N. Lewis; F/O. J. I. G. Lewis; W/O. R. Lilley, D.F.C.; Sgt. V. Lodge; Sgt. G. S. Longmate; Sqn. Ldr. V. C. Lovell, D.F.C.; Sgt. S. McConnell; Sgt. D. Mackay; P/O. H. D. S. M. J. MacKay; Sgt. J. H. McVey; Flt. Lt. N. Marwood-Tucker; F/O. E. T. Meaker; Sgt. E. A. Miller; F/O. D. J. Moore; Flt. Lt. J. F. Muir; P/O. E. C. Nixon, D.F.M.; Flt. Sgt. F. H. Nopper; Flt. Sgt. W. P. H. O'Neill; Sgt. G. J. Patterson; F/O. V. C. Phipps; Flt. Sgt. A. Pickstone; Flt. Sgt. L. Porter; F/O. O. W. Porter; Flt. Sgt. I. C. Redfearn, D.F.M.; P/O. H. G. P. Reed; F/O. A. E. Robbins, D.F.C.; Flt. Lt. G. Roberts; Flt. Sgt. B. L. Robinson, D.F.M.; Flt. Sgt. J. J. Rogers; Sgt. D. Rolfe; F/O. D. Rudd; Sgt. F. Shaw; Sgt. T. J. Sheridan; Sgt. W. Shorten; Sgt. A. B. H. Sims; F/O. J. Smith; Flt. Sgt. P. C. Smith; Flt. Sgt. W. Smith; Flt. Sgt. J. Smyth; Flt. Sgt. G. Tate; Sgt. G. Taylor; Sgt. I. B. Thomas; Flt. Sgt. K. F. Thomas; Flt. Lt. E. N. Thompson, D.F.C.; Sgt. R. J. Thompson; P/O. J. W. Tonkyn; Flt. Sgt. J. Turner; F/O. J. A. Turner; Sgt. E. Wardman; P/O. G. Watson; Sgt. G. A. Weddle; Flt. Sgt. H. E. Whale; Flt. Sgt. K. J. White; Flt. Sgt. T. Whitton; Sgt. W. Wigham; Sgt. P. A. Wildsmith; Sgt. K. G. Wooden.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—P/O. W. H. Hepburn; Sgt. E. J. Payne.

WOUNDED OR INJURED IN ACTION.—Sgt. D. A. M. Botterill; Flt Sgt. S. McQuillan; Flt. Sgt. P. R. Shipperd.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. E. Orton.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. W. G. Godfrey; Sgt. E. G. Gully; Flt. Lt. B. J. Hines; Flt. Sgt. E. G. Hobbs; Flt. Sgt. A. Johnstone; Flt. Sgt. G. A. Keens; Flt. Sgt. A. J. Marrable; F/O. J. E. Sweetman; Flt. Sgt. W. R. Wilcox.

MISSING.—Sgt. J. C. Baker; Sgt. M. G. Bliss; F/O. D. J. Boston; Flt. Sgt. L. E. Cannock; Sgt. G. W. Carter; Flt. Lt. P. B. Cornwallis; Sgt. J. E. Cory; Sgt. D. C. Davies; W/O. G. E. Foster; F/O. L. J. Gornall, D.F.C.; Flt. Sgt. R. Hadlow; Flt. Sgt. F. W. Heron; Flt. Sgt. C. Jackson; Sgt. E. C. Jarvis; F/O. W. Jessop; P/O. A. A. McDonald; Sgt. E. Mackenzie; Sqn. Ldr. R. D. McLaren; Sgt. D. Moroney; F/O. G. D. Morrison; Sgt. G. W. Mount; P/O. H. Osbourn; Flt. Sgt. C. W. Palmer; P/O. S. A. Pepworth, D.F.M.; F/O. R. W. Ponting; Sgt. J. P. J. Power; Flt. Lt. J. Ray; Sgt. J. McD. Sinclair; P/O. J. P. W. Taylor; Flt. Sgt. H. B. Tennant; F/O. L. A. Thorpe; Flt. Sgt. L. Trowdale; Flt. Sgt. J. J. Williams.

KILLED ON ACTIVE SERVICE.—Flt. Lt. J. W. Collins; W/O. S. R. T. Godfrey; Flt. Sgt. R. M. Wedgwood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. C. A. Chandler; F/O. P. L. Collins; Flt. Sgt. J. A. Johnson; Sgt. J. McMillan; Flt. Sgt. H. H. Moulden; Sgt. R. J. Poulton.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. J. H. W. Allen; F/O. G. W. Rowe.

DIED ON ACTIVE SERVICE.—Cpl. D. Wood.

Royal Australian Air Force

KILLED IN ACTION.—F/O. B. F. O'Neill; F/O. F. E. Watkin; F/O. H. H. Wolfson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. M. Baker; Flt. Sgt. P. G. Gotto; Flt. Sgt. V. N. Hansen.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. F. F. Austerberry.

MISSING.—Flt. Lt. C. Mapletoft; Flt. Sgt. R. G. Pryor; F/O. J. E. Stanton; W/O. B. D. Tovey; Flt. Sgt M. R. Vagg; Flt. Sgt. E. F. Warmer

Royal Canadian Air Force

KILLED IN ACTION.—Flt. Sgt. M. J. Brewer; F/O. S. T. Carson; P/O. W. Cowan; Sgt. F. G. Fisher; Flt. Sgt. J. L. Gallipeau; Flt. Sgt. J. Gardiner; W/O. M. E. Granbois; F/O. G. K. Grier; F/O. J. C. McAllister; W/O. A. Mackie; F/O. J. R. A. Maconachie; W/O. J. B. McGovern; Flt. Sgt. R. C. MacNicoll; F/O. R. McD. Scott; Flt. Sgt. A. A. Swihura; F/O. K. F. Whitehouse.

WOUNDED OR INJURED IN ACTION.—F/O. H. I. Storen.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Lt. J. F. Filteau.

MISSING, BELIEVED KILLED IN ACTION.—F/O. R. S. Edick; F/O. C. A. Holmlund; P/O. E. A. Innes; F/O. A. Kotyk; F/O. H. Lochhead.

MISSING.—Flt. Sgt. E. R. Alm; Flt. Lt. I. B. Benson; F/O. R. J. L. Boucher; Flt. Sgt. R. C. Brown; Flt. Sgt. J. G. R. Buchanan; P/O. P. H. Burne; W/O. L. A. Chadwick; F/O. L. P. Cloutier; Flt. Lt. W. M. Constable; F/O. J. A. E. T. Cousineau; W/O. C. C. B. Craigie; Flt. Lt. J. G. Doyle; W/O. W. R. Fields; F/O. V. B. Fleming; Flt. Sgt. L. O. Foisy; W/O. J. Gallagher; F/O. W. R. Gibbs; Flt. Sgt. S. S. Hagerty; Flt. Sgt. D. A. Henderson; Flt. Lt. H. M. Hope; Flt. Sgt. R. J. H. Johnstone; Flt. Sgt. W. H. Jones; Sgt. J. R. Kubin; Flt. Sgt. D. E. Le Liever; Flt. Sgt. E. J. McClarty; Flt. Sgt. A. J. McLeod; F/O. L. H. McLeod; F/O. C. W. McMillan; Flt. Lt. M. R. McQuillan; Flt. Lt. E. S. Maguire; Flt. Lt. J. G. Maguire; Flt. Lt. C. S. Moir; Flt. Sgt. T. E. Murphy; Flt. Sgt. R. F. Piercy; F/O. P. Pokryfka; F/O. R. W. A. Rankin; P/O. L. A. Russell; W/O. R. T. Sowter; W/O. R. R. Stuart; Flt. Lt. B. P. Swingler; Flt. Lt. A. J. Vickers; F/O. L. Webster.

KILLED ON ACTIVE SERVICE.—W/O. F. P. Buck; Sgt. E. J. Cooper; F/O. J. W. Coyle; W/O. R. P. Keaist; F/O. F. E. Larkman; F/O. W. A. Leslie; W/O. G. D. McVicar; F/O. E. A. Paterson; Flt. Lt. P. F. Robb; F/O. F. Scott; F/O. J. B. Stoehr; Sgt. A. C. Thoms

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. F. D. Goodey.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—F/O. F. E. Casber; Flt. Sgt. H. H. Hockley; Flt. Lt. D. S. MacNabb.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. R. B Wilson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. C. F. Benefield, D.F.C.; P/O. R. H. Bruhns, D.F.C.; Flt. Lt. B. G. Collyns, D.F.C.; Flt. Lt. J. F. Craig; D.F.C.; F/O. H. J. Drawbridge; F/O. C. L. M. Forsyth, D.F.M.; Flt. Sgt. F. M. Larnach; Flt. Sgt. G. S. Richardson.

DIED ON ACTIVE SERVICE.—Flt. Sgt. E. E. Cameron.

DECORATED: Air Chief Marshal Sir Arthur Tedder congratulates Brig. Gen. Stanley R. Micklesen on being awarded the O.B.E.

Official Corrections

Casualty Communiqué No. 530.

Under "MISSING, BELIEVED KILLED IN ACTION" delete F/O. J. M. Hartman.

Under "MISSING" delete Sgt. J. T. Breeze, Sgt. W. L. Clarke, Sgt. J. Corbett, Sgt. W. Haile, Flt. Sgt. T. F. Kyle, Sgt. J. P. Maguire, Flt. Sgt. F. E. Mayer, Sgt. A. J. E. Morton, Sgt. W. M. Philpotts, F/O. G. Pond, Sgt. A. Robinson, F/O. L. G. Sleven, Sgt. N. E. Smith, Sgt. W. Summers, Flt. Sgt. R. Taylor, Sgt. E. J. Turner, Sgt. K. E. White.

R.A.A.F.—Under "MISSING" delete F/O. C. Denley.

S.A.A.F.—Under "MISSING," for D. K. Austin, read Lt. D. K. Austin.